Engineering Psychology Handbook

AY 2012 – 2013

Department of Behavioral Sciences and Leadership
United States Military Academy

Editor:
MAJ Louis P. Nemec

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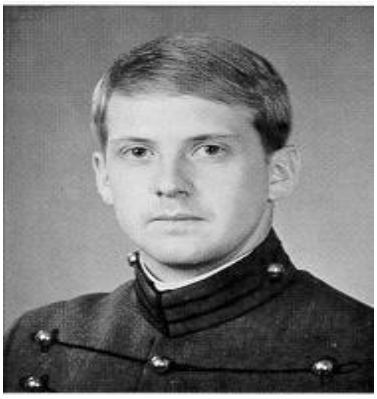
Kurkowski – Reed
Excellence in Engineering Psychology Award



Christopher Douglas Kurkowski
September 23, 1964 - February 26, 1988

Joseph Oliver Reed, III
February 21, 1966 - April 14, 1996

The Kurkowski-Reed Excellence in Engineering Psychology Award was established in 2001. The award honors Christopher Kurkowski (USMA, Class of 1986) and Joseph Reed (USMA, Class of 1989). Both were Engineering Psychology majors whose lives were cut short in aviation accidents while on active duty. The award was made possible through the generosity of the classes of 1986 and 1989 who deemed it a fitting tribute to the service and sacrifice of their classmates.

The award goes to the graduating cadet with the highest grade point average in the Engineering Psychology courses that are common to both the honors and major program. The award winner receives a silver tray at a Department of Behavioral Sciences and Leadership Ceremony during Graduation Week. In addition, the award winner's name is engraved on a plaque that resides in the department Awards Room.

2001 Honoree: Anastasia Piotrowski
2002 Honoree: Jennifer Smith
2003 Honoree: Joseph Mitek
2004 Honoree: Eric Wagoner
2005 Honoree: Ryan S. Labio
2006 Honoree: Brandon M. Kennedy
2007 Honoree: Kyle R. Storjohann
2008 Honoree: David Feltner
2009 Honoree: Nathaniel Drake
2010 Honoree: David G. Johnson
2011 Honoree: Cort Mukina
2012 Honoree: Matthew Ryan

DEPARTMENT OF THE ARMY
UNITED STATES MILITARY ACADEMY
West Point, New York 10996

MADN-BSL August 2012

To Cadets Enrolled in the Engineering Psychology Program:

Congratulations on your selection of Engineering Psychology as your Major! Engineering Psychology (or Human Factors) is a dynamic and challenging field, where technological advances are being developed almost daily. To maintain its status as the world's premier land power, the United States Army will require more sophisticated technology. Human-centered design will be a crucial factor in the effectiveness of the equipment soldiers use to fight and win America's wars. Engineering psychologists make invaluable contributions in conducting theoretical and applied research, in designing human-centered equipment and in introducing that equipment into an organization.

In many ways, the engineering psychologist is the interface between engineers and psychologists. As such, you will be the one to ensure that humans and machines interact well together. Just as you are responsible for human-machine interaction, you often will serve the unique role of integrating the understanding of engineers, psychologists, and management.

Throughout the next two years, you will grow from educated lay persons into budding young scientists. You will also develop a frame of reference that will cause you to view the world in a unique way - through the eyes of a human-centered scientist who is also capable of developing and implementing practical solutions. Starting with introductory research methods classes (PL386 and MA376) and a basic biopsychology class (PL390), you will progress through increasingly more challenging courses until you finish with an analysis and a design of an actual human-machine system. *The Engineering Psychology faculty will partner with you in this learning process*. We are truly here to make your transformation into an Engineering Psychologist a rewarding experience. You can contact the Engineering Psychology Faculty and Staff at any time.

COL James Ness, Ph.D.
Engineering Psychology Program Director

Engineering Psychology Faculty and Staff

Name	Thayer Room	Office Phone
COL James Ness (Program Director)	267D	0239
Dr. Michael Matthews	283	3696
MAJ Lou Nemec	267E	0066
Dr. Ericka Rovira	267B	5902
Ms. Vasiliki "Bess" Georgoulas	262	3598

The following exceptional soldiers and civilians had the privilege of working as teammates in the Engineering Psychology program. Recent contact information is provided for many.

MAJ Jennifer Bower	jennifer.bower@us.army.mil
COL Joseph P. DeAntona	joseph.deantona@us.army.mil
Dr. Gina Kolisinski	
MAJ Silas Martinez	
MAJ Mark McMillion	
COL Douglas Mulbery	
LTC(R) Timothy O'Neill	tro28th@aol.com
COL(R) Larry Shattuck	lgshattu@nps.edu
SPC Agent Joe Shevlin	
MAJ Jared Sloan	jared.sloan@iraq.centcom.mil
LTC Christopher Talcott	
MAJ Stoney Trent	
MAJ Carla Joyner	
MAJ Joseph McLaine	
Ms. Tish Torgerson	tish.torgerson@usma.edu
MAJ Bart Wilkison	bart.wilkison@us.army.mil
LTC(R) James Merlo	james.merlo@us.army.mil
MAJ Dan Hall	daniel.s.hall@us.army.mil

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Engineering Psychology Handbook

What is the Engineering Psychology Handbook?

As you should know by now, the Engineering Psychology curriculum is unique among academic fields at West Point because of its interdisciplinary and integrated electives. All cadets take the same electives in the same sequence. This design allows maximum integration among courses and eliminates the "dump" mentality. You can't afford to forget what you've learned in previous Engineering Psychology courses because material in PL386 (Experimental Psychology), for example, is used in all other Engineering Psychology courses. Likewise, knowledge of the anatomical and physiological characteristics of the eye, mastered in PL390 (Biopsychology), is needed to understand visual perception in PL391 (Sensation & Perception) and cognitive processes in PL392 (Cognitive Psychology).

Accordingly, uniform standards for work in all Engineering Psychology courses exist. For example, the written report is the fundamental exchange medium between instructor and cadet. During your first semester in Engineering Psychology, you will learn how to write a report (in PL386). Later, you will use that knowledge to compose reports for other courses. Regardless of the course, your Engineering Psychology instructors will use the same criteria to evaluate your work - the criteria contained in this Handbook. Therefore, a thorough understanding of what's contained in this Handbook will not only reduce your workload, but quite probably will result in a higher grade. It has been developed to complement, clarify, and tailor the material found in both the Little, Brown Handbook and the Dean's Documentation of Academic Work (2010). Keep it for the rest of your time at West Point and refer to it often.

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Engineering Psychology General Policies and Procedures

Throughout the Engineering Psychology curriculum, we have standardized several academic policies designed to enhance your learning and reduce potential confusion that might exist among the courses. The following is a list of the policies and procedures that are standard to all Engineering Psychology courses.

Educational Philosophy

The Engineering Psychology faculty work to create a cooperative learning environment. Though all of us have advanced degrees in some aspect of Engineering Psychology, we do not pretend to know all the answers. Rather than remaining aloof and placing the burden on you to extract the right information from us, we prefer to come along side you, to partner with you as we both gain more knowledge and experience in this exciting discipline. You are the apprentices and we are the journeymen who will guide you. Other characteristics of our educational philosophy include:

High Standards

We set the bar high. But, we have found that not only do cadets meet the standards, they enjoy being challenged to reach their full potential. Your success to date at the Academy is because you have high standards; we plan to capitalize on this fact.

Availability

We will make ourselves available to you as much as we possibly can - day or night. We are here to teach you and we are committed to your success. With that said, however, you should realize that we have a lot of demands on our time. You can increase the likelihood that we will be available to meet with you if you schedule a meeting in advance rather than just dropping by our offices. Not only does scheduling a meeting with us ensure our availability, it demonstrates courtesy.

Out of Classroom Meetings

Most courses in the Engineering Psychology program include a large project. Although we will provide you with detailed criteria of our expectations, you will find it necessary to meet with us outside of the classroom. We stand ready to assist you, to send you down the right paths, and to pull you back when you begin to wander down the wrong ones. But it's up to you to come to us. Coming to see us early and often will maximize your learning and ensure a better grade.

Group/Individual Activities

Throughout the Engineering Psychology curriculum you will engage in both individual activities and group activities. Individual work gives us the ability to develop and assess your particular knowledge, skills, and abilities. Group work is typically done for several reasons. First, the scope of the project is too large for any one cadet to reasonably complete given the time limits of a semester. Second, since most real work is done as part of a team, this experience provides you the opportunity to work

cooperatively as you will in the Army. Third, the group process gives you insight into different viewpoints and develops your ability to "sell" your point of view.

Group activities are meant to be synergistic. That is, we expect the outcome of your group work to be greater than the sum of the members' individual labors. A group project *does not mean* that one cadet works on the introduction of a report, another works on the method section, another works on the results section, and at the end the individual work is cut and pasted together. A group project *does mean* that all cadets in the group are intellectually engaged in all aspects of the project.

Specific courses within the Engineering Psychology program may or may not provide cadets the opportunity to formally evaluate group members' contributions to a project. Whether or not a formal process exists, we encourage you to talk to us whenever there is a significant disparity in the contributions of group members and you have not been able to resolve the problem amongst yourselves. If problems do exist, try to work them out early. If you can't resolve them, notify your instructor. Waiting until just before a project is due to raise a problem diminishes our ability to intervene.

Pre-looks

All Engineering Psychology instructors encourage pre-looks of your written submissions. It has been our experience that cadets can raise their score by at least a full letter grade when they submit their paper for a pre-look. A lot of learning occurs when you review the comments made by your instructor and modify your paper accordingly. Pre-looks should be submitted the lesson before the assignment is due (i.e., not less than 48 hours). We will review, make comments, and return it to you at least the day before the requirement is due.

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Curriculum

The Engineering Psychology curriculum is highly integrated and cumulative. That is, the courses build on each other, and success in higher level courses depends on learning the material presented in lower level courses. For example, cadets learn about the structure and function of the nervous system in PL390 (Biological Psychology) in the Fall semester of the Cow year. This knowledge is needed to understand the material covered in PL391 (Sensation, Perception, and Psychophysics) and PL392 (Cognitive Psychology) taken in the Spring semester of the Cow year. In turn, the material covered during the Cow year serves as the basis for understanding theory and application covered in Firstie year courses, such as PL475 (Human Computer Interaction) and PL485 (Human Factors Engineering).

Engineering Psychology is an experimental/scientific discipline. As such, it requires mastery of statistics and research design. MA376 (Applied Probability and Statistics) and PL386 (Experimental Psychology), taken during the fall semester of the Cow year, provide the research, design, and statistical skills required in all other Engineering Psychology courses. These skills are best learned and sharpened by frequent application to real experimental questions. In your four semesters in the Engineering Psychology major, you will design and conduct several experiments, analyze data using appropriate statistical procedures, write scientific research reports to document your research, and

orally present your results to your peers and faculty. You may even have a chance to present results of your experiments at a national conference and/or publish them in a scholarly journal. During this past academic year, 2011-2012, cadets presented papers at the Army Research Laboratory Conference in Atlantic City, NJ in November 2011. An Engineering Psychology major typically takes the following sequence of courses (students that desire and meet entry requirements to participate in the Honors Program take the additional two electives during the Firstie year.)

Table 1

Typical Engineering Psychology Course Schedule

Fall, 2nd Class Year	***Spring, 2nd Class Year***	***Fall, 1st Class Year***	***Spring, 1st Class Year***
PL390, Biological Psychology	PL391, Sensation, Perception, and Psychophysics	PL475, Human Computer Interaction	PL488E, Colloquium in Engineering Psychology
MA376, Applied Probability and Statistics	PL392, Cognitive Psychology	PL485, Human Factors Engineering	PL490, Engineering Psychology Design & Application
PL386, Experimental Psychology	PL394, Anthropometrics and Biomechanics	Elective (Honors only)	Elective (Honors only)

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Course Content

Engineering Psychology courses typically provide a brief history of the discipline, followed by simple facts and major theories that cadets will integrate and use in their final course project. Each lesson will list one or more Lesson Objectives (LOs) and several Performance Objectives (POs). The Performance Objectives (POs) indicate the information ***you*** should master ***prior*** to class. In class, your instructor will assist you in achieving the LOs. Most courses (PL488E and PL 490 are the exception) consist of both subjective and objective testing methods that include Daily Study Questions (DSQs), Written Partial Reviews (WPRs), written and oral projects, and a Term End Examination (TEE).

Lesson Outlines

All courses will have lesson outlines. The lesson outlines are found in the course guide and describe what is expected of cadets for every class period. Generally, each lesson will be comprised of a study assignment, Lesson Objective(s), Performance Objectives, and special instructions, if required. All Lesson and Performance Objectives follow Bloom's taxonomy (Appendix A). Bloom's taxonomy is a list of key words and their definitions that describe increasingly more sophisticated levels of understanding. You should pay attention to the words from Bloom's taxonomy that are used in the Lesson Outlines (usually **bolded**, underlined, *italicized*, or some combination of all ***three***) because they determine the cognitive complexity of the questions we will ask on WPRs. For example, if a PO uses "***Define***," we will ask you to give the meaning of a term; however, if the PO uses "***Apply***," we will expect you to use a theory to solve a problem.

Taxonomy terms that specify a particular level of understanding assume that you are able to answer questions at that level and all levels of lesser sophistication.

DSQs

Toward the beginning of any given class meeting your instructors may test your preparedness for class using a Daily Study Question (DSQ). The total number of DSQs will vary between courses, but each will test a PO required for that lesson. You can ensure success on DSQs by preparing for class and having all POs answered prior to class.

WPRs

WPRs normally include both subjective and objective portions. Objective questions may include multiple choice, matching, or fill in the blank that cover the POs for that testing cycle. The subjective portion will typically be in the form of short answer/essay questions and will generally address the lesson objectives covered during that testing period. Since no test is perfect, ***you may contest your answers that were marked wrong*** by providing your instructor with a ***written*** statement explaining why your response is correct. This approach affords us the opportunity to see where the question might be ambiguous or where your reasoning may be flawed. All contested answers will be given to your instructor by the beginning of next lesson in written format. No group responses will be accepted; each cadet must submit his/her own written rebuttal. The awarding of points is at the sole discretion of the instructor.

Term End Examination

Each TEE will also consist of subjective and objective portions. The objective portion will focus on PO level of knowledge, whereas the subjective questions will address integrative LO knowledge. All TEEs will be a least 20% of the course grade. Although most engineering psychology courses have TEEs, there are some exceptions (such as the valedictory courses, PL488E and PL490 which do not have TEEs). You should consult individual course guides to determine if a particular course has a TEE or not.

Written and Oral Projects

Each course will have written and oral projects. Oral presentations will be accompanied by a top quality PowerPoint computer-generated slide presentation. All written projects will be turned in to the section marcher ***at the beginning of the period*** the requirement is due. You are not required to use a 'brown bomber' when submitting your written work. Other guidelines for both oral and written work follow later in this Handbook. Due to course differences, any deviations from those noted in the Handbook will be specifically explained by your instructor for that course.

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Documentation

Good scholarship is not synonymous with originality. Good scholarship happens when you dive into the literature, properly interpret and synthesize the relevant ideas of others, and use what you've learned to guide your research, to interpret your results, or to form new knowledge. Building on the intellectual foundation laid by others adds credibility to your work. Good scholarship also means proper documentation.

The Dean's Documentation of Academic Work (2011) for AY 2012 - 2013 dictates that The Little, Brown Handbook (Fowler, Aaron, & Brittenham, 1998) will be used as the reference for proper documentation. The Little, Brown Handbook (LBH) describes four documentation styles and the Dean's pamphlet leaves it to the discretion of academic department heads to select the style most appropriate for their disciplines. The department head of BS&L has selected the American Psychological Association (APA) style of documentation. Accordingly, papers you submit for grade in any Engineering Psychology course will follow USMA and APA documentation policies. This includes

- Parenthetical references (author's last name(s), year of publication) to acknowledge sources cited in the text of your paper.
- Endnotes (not footnotes) to document collaboration.
- A reference list (not a bibliography), including entries for both sources cited in the text and the collaboration activities listed in the endnotes.

We recognize that documentation can be a source of confusion and frustration for cadets. However, proper documentation is essential if you are to acknowledge the contributions that others have made to your work. The Dean's Documentation of Academic Work (2011), The Little, Brown Handbook and *especially* the sixth edition of the APA Publication Manual should answer most of your questions about format and documentation. This Engineering Psychology Handbook is intended be a handy, easy to use source that synthesizes the requirements from all three sources to help you generate well written, documented, and formatted manuscripts. Later in this Handbook, you will find a sample research paper (see Appendix I) that can be used as a template for preparing your papers. Since all the engineering psychology instructors evaluate your paper for format, it is best to abide by the guidelines provided, but if a situation is ever unclear, here are a few general principles that should be useful:

Principle 1. When in doubt, document. It's much better to document a source when it is not necessary than to not document a source when you should have done so.

Principle 2. Provide us sufficient information in your reference so that we can find the source on our own if we want to learn more.

Principle 3. If Principles 1 or 2 do not help to clarify things, ask your Engineering Psychology instructor!

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Feedback

In an effort to continually improve the Engineering Psychology Program, we regularly solicit feedback from you throughout the course in the form of mid-course critiques (usually a one-question feedback sheet at the end of a lesson). Should you consider something to be effective or ineffective, please discuss it with us then and/or at any time. Pay particular attention to techniques that assist you in comprehending and integrating material within and between courses. We care very deeply about providing you the best academic and military mentorship we can – and the more feedback we receive the better we will serve you and the Army.

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Institutional Research

Many of the courses in Engineering Psychology will require you to perform a research project. This research will require you to have approval of the academy's Institutional Review Board (IRB) prior to gathering data. Although approval is usually given, certain rules and procedures must be followed to obtain that approval. These procedures, instructions, and necessary forms can be accessed via sharepoint. Your instructor will provide you with the link. Appendix B also provides you with the same information. You may choose to download the forms onto your computer and type in the required information or you may reproduce them from this document and type in the required information. Do not turn in the forms with handwritten information as this portrays an unprofessional image and may discredit your project.

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Statistical Packages

The SPSS statistical package is suitable for your data analysis. SPSS software is available on the Engineering Psychology Laboratory computers and can be used when the lab is open. At other times, contact any Engineering Psychology instructor or Ms. Vasiliki Georgoulas to get access to lab facilities.

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Research Reports and the Philosophy of Science

When you originally learned to write, you learned the expository style of writing. The expository method requires one to state a thesis, then attempt to **prove** that thesis through argument, based more or less on the dialectic style of the Greek philosophers. For a scientist, this style is fatally flawed and should not be used. Scientists are skeptics. We are not concerned with proving theories. Instead, we seek to describe reality and discover truth. The expository style might cause scientists to lend a blind eye to contrary explanations for their test results. Additionally, in most cases, one **can never prove** a theory anyway. To prove it, one would have to use a 100% sample (that is, test the population of all cases). In most cases, testing the entire population is not practical. Still, theories can be empirically tested through scientific experimentation and observation; a theory **can be disproved**.

Consequently, we use the *scientific, or hypothetico-deductive* method, which reverses the expository approach and tries to disprove our theory. This approach means, in practical experimental terms that we attempt to reject a hypothesis derived from the theory. Failure to accomplish this, "rejecting the null hypothesis," is usually defined as a "success." Accordingly, the format for research reports will reflect this objective, skeptical bias.

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APA Format

This section describes how to construct your research paper. Although BS&L and the Engineering Psychology program have adopted the APA style for written submissions, there are USMA-specific requirements described in the Dean's Documentation of Academic Work (2010) that must be blended into the APA format. Since you will have to use this blended format for virtually every course in the Engineering Psychology program it is worth your time and energy to familiarize yourself with the information contained herein. The 6th edition of the APA Publication Manual is the standard for all Engineering Psychology courses, and all research reports will contain the following:

- USMA title page (from the Dean's Documentation of Academic Work pamphlet)
- APA-style title page (as described in the APA Publication Manual, 6th Edition)
- Abstract
- Introduction (including problem statement, literature review, hypothesis)
- Method (including Participants, Apparatus, and Procedure sub-sections)
- Results
- Discussion
- Notes
- References
- Appendices
- Tables and Figures

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USMA Title Page

UNITED STATES MILITARY ACADEMY

Title page is double-spaced

ORDERING OF INFORMATION AND

EFFECTS ON THE CONCLUSION DRAWN

All text on title page is capitalized

PL386: EXPERIMENTAL PSYCHOLOGY

SECTION 1H

COL LAWRENCE SHATTUCK

BY

CADET JILL ERWAY '05, CO D3

WEST POINT, NEW YORK

11 DECEMBER 2002

The title of your research report should be short (no more than 10-12 words), succinct, and describe your experiment accurately. It should allude to both the variables and the data collection methods. Avoid cute titles. A title should inform, not amuse. If you want to have an offbeat title, be certain it's for a reason that makes scientific sense. If you are reporting on the influence of stimulus brightness on critical flicker fusion, don't choose a title like "Visual Perception" or "Flicker Fusion." These titles may suggest you are testing everything related to visual perception (quite a large experiment!) or whether flicker fusion exists (it does). Instead, a title like "The Influence of Stimulus Brightness on Critical Flicker Fusion" will do nicely.

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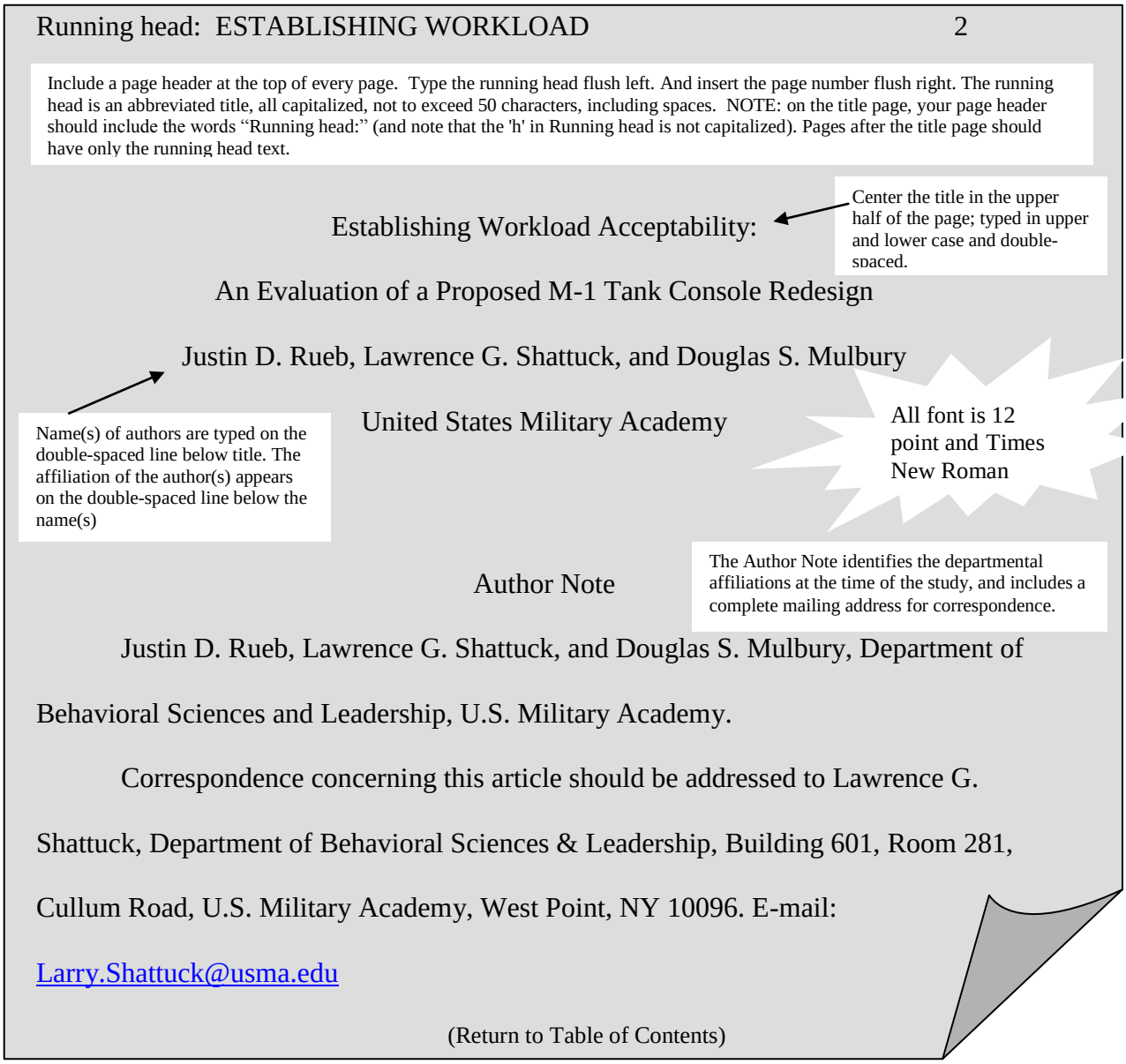
APA-Style Title Page



Abstract

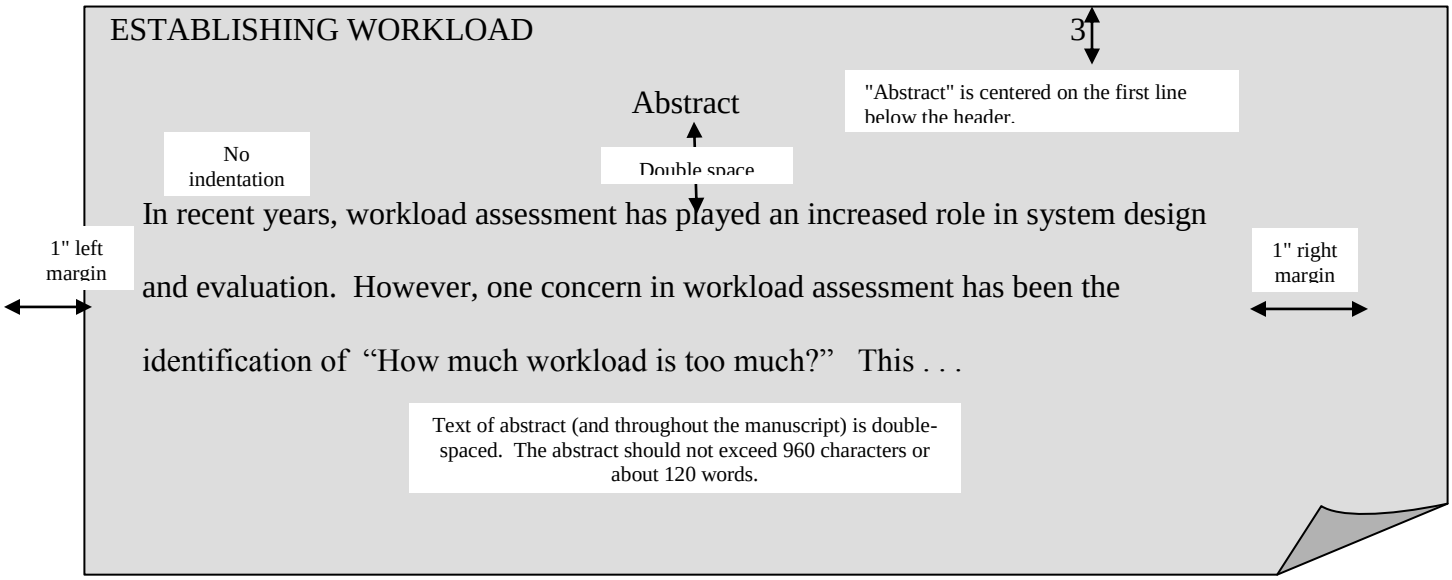
The abstract is a summary of the research, not to exceed 960 characters (approximately 120 words), including punctuation and spaces. The abstract is written on a page of its own with the word "Abstract" centered on the page and the text in a single block paragraph without a tab (see example on next page). The purpose of the abstract is to inform the reader about the experiment and allow them to decide whether or not to read the whole article.

To accomplish this abstracts usually:

1. Start with a sentence or two of background to introduce the problem, establish interest, and identify the applicable psychological theory under study.
2. Next, they succinctly summarize the experimental task/method and the experimental design, to include identifying the independent and dependent variables.
3. Then, they concisely summarize the results.
4. Finally, they cite the most important theoretical and/or practical implications of the findings.

Common mistakes include the following:

- **Failure to adequately accomplish directives 1 -4 above**.
- **Use of the future tense**. The experiment is over and the use of past tense is appropriate. The only exception is for a research proposal.
- **Use of We & I.** The words "we" or "I" should not be used in the Abstract.
- **Inclusion of excess detail**. Precise procedures/apparatus are best confined to the body of the text. Do not state your hypothesis or cite exact statistics.



Introduction

Begin the introduction on page 4 (the first 2 pages are the title pages, the third is the abstract). Begin the body of the report with the title centered. It should in upper/lower case with the first letter of the title and key words capitalized in the conventional way. Like the text, the title should be double-spaced. Next, indent the first paragraph and begin the text of the introduction (as shown on the next page). The purpose of the introduction is to grab the reader and guide them to understand that your research is a justified, well conceived, next logical step in the investigation of your area of engineering psychology.

To accomplish this introduction usually:

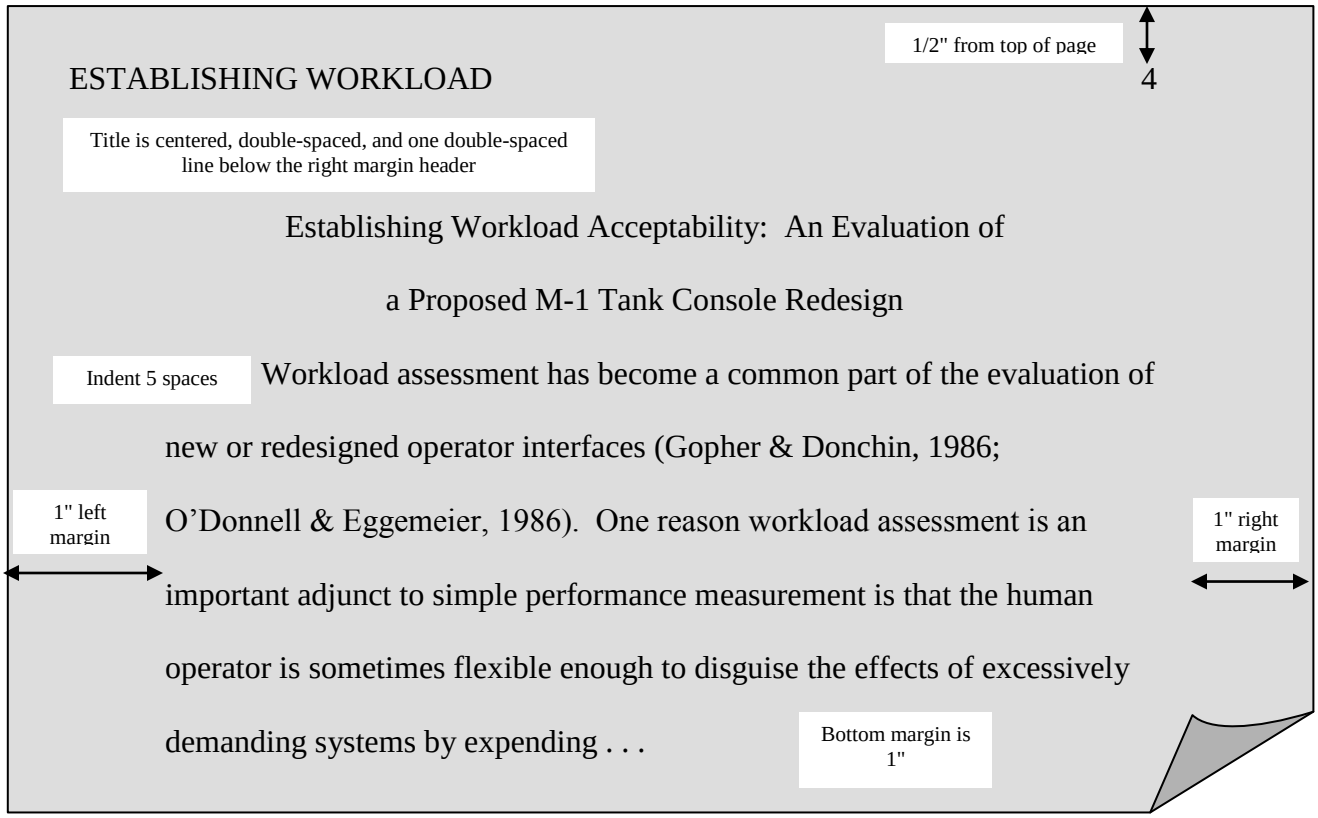
1. Provide a brief, but broad, background of the issue/theory under study. In doing so you must establish the importance of the issue and grab the interest of the reader.
2. Second (or third), state the purpose of your current research (e.g. identify what questions remain and what specific research question you investigated).
3. Third, (or second) summarize the pertinent literature that serves as a background (and justification) for your own research, your design, and your own hypothesis. There are three main types of literature that are pertinent and should be cited - each source you cite should inform your own research in one of three ways:
    a. Psychological Theory- *Most importantly,* you should cite sources that describe the psychological theories that are relevant to your research question (or that are being investigated by your research).
    b. Domain- You should cite sources that described the domain in which you investigated your psychological research question (i.e. if investigating decision making in a military setting you might cite Army doctrine and/or field manuals).
    c. Methodological- You should cite prior research describing methodologies that other researchers have used to investigate this or similar questions (or cite other literature that serves to justify your choice of experimental task, your experimental design, your variables, measures, etc.)

Note: Individual citations should be concise. Include only essential details to understanding/supporting your own research. You may sometimes elaborate more on major studies but otherwise, simply state what prior researchers studied; what they found or learned; and how it informs your research, your design, your methodology, or hypothesis.

4. Lastly, in well written introductions, all of the above should *flow logically to (and support) your hypothesis*, which you should state at the end of the introduction section.

Common mistakes include the following:

- **<u>Failure to adequately accomplish directives 1-4 above</u>**.
- **<u>Failure to construct a logical argument justifying you research and/or your hypothesis</u>**.
- **<u>Failure to transition well between citations of specific pieces of literature</u>**
  You must explain to the reader how and why the prior research in an area led you to design and execute the current research in the manner you chose to do it.



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Method

The method section will receive the closest scrutiny because scientists may want to replicate your work or simply may look for alternative explanations for your results. The Method section will have at least three sub-sections (Participants, Apparatus, and Procedure):

1. Participants

The Participants section includes a succinct description of the relevant characteristics of the sample group. How many, how old, from what population, and method of selection are all typical questions that should be answered by this section. The applicable characteristics and statistics may be presented in tables by experimental group so that readers may evaluate for potential biases across experimental groups – or they may be cited in the text as shown (on the next page).

For example:

> Twenty male Sprague-Dawley rats twelve-weeks old were used in this experiment. They varied in weight from 282 to 326 grams.

or

> Eighteen undergraduate freshmen at the United States Military Academy, ranging in age from 17 - 21, participated in this study. All were enrolled in a General Psychology course and received credit for their participation. They were screened for visual acuity (Snellen) and color vision (Dvorine Pseudoisochromatic).

Ethics Statement. After describing the participants used in your experiment, complete the Participants section with the statement:

"Participants were treated in accordance with ethical standards established by the American Psychological Association. The research methods used in this experiment were approved by the U.S. Military Academy Human Subjects Use Committee."

Occasionally a variety of common terms are abbreviated - among them, Participant(s) (P, Ps), Observer(s) (O, Os) and Experimenter (E). Generally, this approach is used only when the frequency of the fully spelled word may begin to annoy the reader. In any case, the first instance of an abbreviated term should always be spelled out and then followed immediately by the abbreviation - United States Military Academy (USMA).

Common mistakes include the following:

- **Failure to provide applicable demographics or characteristics of interest.**
- **Failure to include the Ethics Statement.**
- **Use of inappropriate terminology. Specifically (in the APA style) humans who take part in research are referred to as "participants." Animals who take part in research are referred to as "subjects."**

2. Apparatus

This section provides sufficient detail to allow another researcher to replicate the research with enough accuracy to avoid apparatus-related variance. However, extraneous detail is not acceptable (i.e. you don't need to specify that you used a "No. 2 pencil and 8 1/2" x 11" white bond paper" to record participant responses). Readers can still replicate your study if they use a pen and some other type of paper. Yet, it is important and useful to describe a computer in such detail that you give readers information about processing speed, monitor size, resolution, and refresh rate since each of these may impact on the presentation of stimuli. For describing visual displays, visual size must be specified in degrees of visual angle. An official nomenclature for most common apparatus used in our lab can be found in Appendix G.

3. Procedure

This section should be detailed enough for a reader familiar with the field to replicate your experiment without calling you for clarification. If *not previously covered in the introduction*, you should begin with:

- a concise statement of the experimental design
- a precise explanation of the operational definitions of the variables, and
- a precise description of the experimental task and conditions

Otherwise, simply give a detailed description of how the data was collected (usually recounting the experience of a single participant, in chronological order, from reception to data collection, through release).

Note: **A common stylistic error involves overuse of weak passive forms.** Inexperienced writers may fall to this habit because it "seems more scientific," and it is easy to do. For example: "All participants in the control group were administered the sham treatment." Passive sentences waste words and fail to communicate who did what. Although, occasional passive voice in this section may be unavoidable, in general, you should write in **active** voice. For example: "All participants in the control group *received* the sham treatment." **A word of caution**: Although you are allowed to use the first person, most writers avoid its use because it detracts and makes the paper appear "folksy" and less polished. If critical instructions are given to the participant by the experimenter, include them verbatim (most likely, reference them in an Appendix). Do this only when the wording of the instructions could be considered critical to the nature of the response.

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Results

The purpose of the results section is to communicate what you measured (e.g. the data), as well as the results of your statistical analysis. In general you will do this by reporting two types of statistics (descriptive and inferential statistics). The descriptive statistics will summarize and describe what you measured. The inferential statistics will clarify if observed differences are 'significant' or not.

Begin the results section by stating what analysis you performed (e.g. "the reaction times were subjected to a 2 way ANOVA procedure…"). Follow this by presenting the descriptive statistics. This is often accomplished by simply referencing a table and/or a figure depicting a straightforward recapitulation of the numerical results by group (means, frequencies, standard deviations, etc.).

End with the inferential statistics. This information can also be included in a table (as shown on the next page) but, for most experiments the significance of the results are reported in text. For example, "Reaction times of fatigued pilots were longer than those of rested pilots, $F(2, 87) = 3.12$, $p = .045$."

Notice that the preceding example obeys a **strict format** for reporting these statistical inferences. The guidelines for this format are found in the APA Publication Manual, but the notation is generally formatted as follows:

> Mean scores for Group 1 were higher than those of Group 2, $t(129) = 3.86$, $p = .032$.

or

> The group main effect was significant, $F(2, 87) = 3.12$, $p = .045$. However, the time main effect was nonsignificant ($p = .165$).

or

> Frequencies of positive response differed significantly across regiments, $\chi^2(4) = 3.86$, $p = .016$

Common mistakes include the following:

- **Be sure to italicize test statistics (*F* and *t*), and also italicize "*p*".**
- **Cite the actual *p* value:** For example, $p = .165$; unless $p < .01$. In that case simply cite it as $p < .01$.
- **The degrees of freedom for the test statistic follow the test statistic in parentheses.**
- **Do not be overly precise**. If measuring how long it takes participants to read several pages of text, then recording the times to the 2nd decimal place (i.e., hundreds of a second) is not necessary. On the other hand, if measuring response time to a simple stimulus presented on a computer, then precision to the 2nd decimal place might be appropriate.
- **Set alpha (α, your acceptable level of risk) *prior* to analyzing your data.** Most commonly, it will be set at .05, meaning that any inferential statistic yielding a probability of a Type I error of .05 or less will be defined as "statistically significant."
- **If an ANOVA table is used to depict the results of your inferential analysis, do it correctly (see below).**

Table 3

An Example of an ANOVA Summary Table

Source	SS	df	MS	*F*	*p*
Between	9352.3	4	2338.01	3.96	< .01
Within	237986.8	403	590.50		
Total	247339.1	407			

- **Assume your reader has a professional knowledge of statistics**. Basic assumptions, such as rejecting the null hypotheses, should not be reviewed. If

a question exists about the appropriateness of a particular test, be sure to justify the use of that test. For example (see below):

> The means for both lesioned and unlesioned rats differed for all time periods, with treatment, $F(1, 27) = 7.91$, $p < .01$, and time, $F(8, 27) = 4.51$, $p < .05$, main effects, but not for time/treatment interaction ($p > .05$). These results should, however, be viewed with caution, since there was no histological verification of lesion sites.

- **"Data" is plural. "Datum" is singular.** Do not say "The Data is …" Proper English would be "The data are…"
- **Do not make interpretations.** The Results section simply presents the statistics and their relationship (meaning that scores are higher/lower, bigger/smaller, etc.). Do not interpret what the data mean with respect to your theory or what it means with respect to design or practice. Theoretical and practical implications are discussed in the Discussion section, not in the Results section!!!
- **Choose the proper statistical test.** Which statistical tests used are dictated by the procedure or methods used in the research. First, you should decide whether to use a parametric or nonparametric test. Parametric tests are appropriate where certain assumptions are met. These assumptions include that the data come from a normal distribution, and that the dependent measure is assessed on an interval or ratio scale of measurement. If either of these assumptions are not warranted, then you may need to use a nonparametric, or distribution-free, test. Nonparametric tests do not require the assumption of normality and may be performed on nominal or ordinal data.

A second factor in deciding what statistical test to use is whether an independent groups or within subjects design is employed. An independent groups design means that a given participant is tested in one and only one condition. For example, in an experiment on the effectiveness of hand-held versus heads-up displays, if different participants serve in each condition, and are not given repeated trials, then this represents an independent groups design. On the other hand, in the experiment just described, if each participant was tested with both a heads-up and a hand-held display, then this would represent a within (also known as correlated samples) design. Different statistical procedures, both parametric and nonparametric, are required for independent versus within group designs. To help you decide what statistic to use, some common statistical procedures and their assumptions are presented in Table 2 (on the next page).

For example, suppose you are comparing three different types of displays on how long it takes viewers to identify targets. If the groups are independent (that is, a participant is in one and only one treatment condition), and the dependent variable involves at least interval data, then simple or one-way analysis of variance (ANOVA) would be the appropriate statistical test. In contrast, if you had the same design just described but the dependent variable was on an ordinal scale, you would use a Kruskal-Wallis test.

Table 2

Decision Matrix for Common Statistical Procedures

Type of Sample	Assumptions
Differences Between Groups	
Two Independent Samples	
t test	Normality, Homogeneity, Interval
Mann-Whitney *U* test	Ordinal
Two Correlated Samples	
t test	Normality, Interval
Wilcoxon test	Ordinal
Multiple Correlated Samples	
Repeated measures ANOVA	Normality, Interval
Friedman two-way ANOVA	Ordinal
Several Independent Samples	
Simple ANOVA	Normality, Homogeneity, Interval
Two-factor ANOVA	Normality, Homogeneity, Interval
Kruskal-Wallis test	Ordinal
Tests of Association	
One Sample	
Pearson product-moment correlation	Normality, Interval
Spearman rank-order correlation	Ordinal
Chi-square test for r x c tables	Nominal
Two Independent Samples	
Test of the difference between two Pearson correlations	Normality, Interval

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Discussion

This section may be combined with the previous section if the discussion is brief and does not require a lot of theoretical restatement. In that case, the section is called ***Results and Discussion.*** Most important, do not simply and redundantly restate your results. The purpose of the discussion section is to communicate the theoretical and practical implications of the results, and point the way for future researchers to continue this line of work. **To accomplish this discussion sections usually:**

1. Begin by *addressing the hypothesis(es)* you detailed at the conclusion of the introduction section. The results of your inferential statistical analysis either support or fail to support your hypotheses.
2. Next, *discuss the theoretical implications of your findings*. Because (in your introduction section) you justified/supported your hypothesis with psychological theory and extant research, it is important to discuss what the results tell us pertaining to that theory and research.
    a. If the data support the hypothesis (e.g., null hypothesis rejected), then the results were expected, were in accordance with and support, the theory and research you cited in the introduction.
    b. If the data fail to support the hypothesis (e.g., relationships or group differences were not statistically significant) then something unexpected happened. This is not necessarily bad – on the contrary it can be very important and interesting. Perhaps existing theory or research were inadequate or flawed in some way? Perhaps the theory we used to deduce the hypothesis should be re-examined or altered in some way? Perhaps future research should investigate alternative explanations for our results which our research design failed to control for? Address any or all these issues as appropriate.
3. Having just discussed (above) what we've learned from these results (the theoretical implications), the next logical issue is to *address the practical implications of your findings*. How might we apply what we've learned to potentially improve human-machine systems to make them safer, more effective, more comfortable?
4. Finally, conclude by *discussing future research*. What research questions remain or are raised by this line of work? Usually one would pose 2-3 suggestions for future research ideas before transitioning the paper to a close.

Common mistakes include the following:

- **Failure to adequately accomplish directives 1-4 above**.
- **Slamming your own research.** It is good scientific practice to identify potential problems with your research, but no study is perfect and questions always remain or are raised. Do not be so condemning that the reader questions your contribution or, worse yet, your ability as a researcher.

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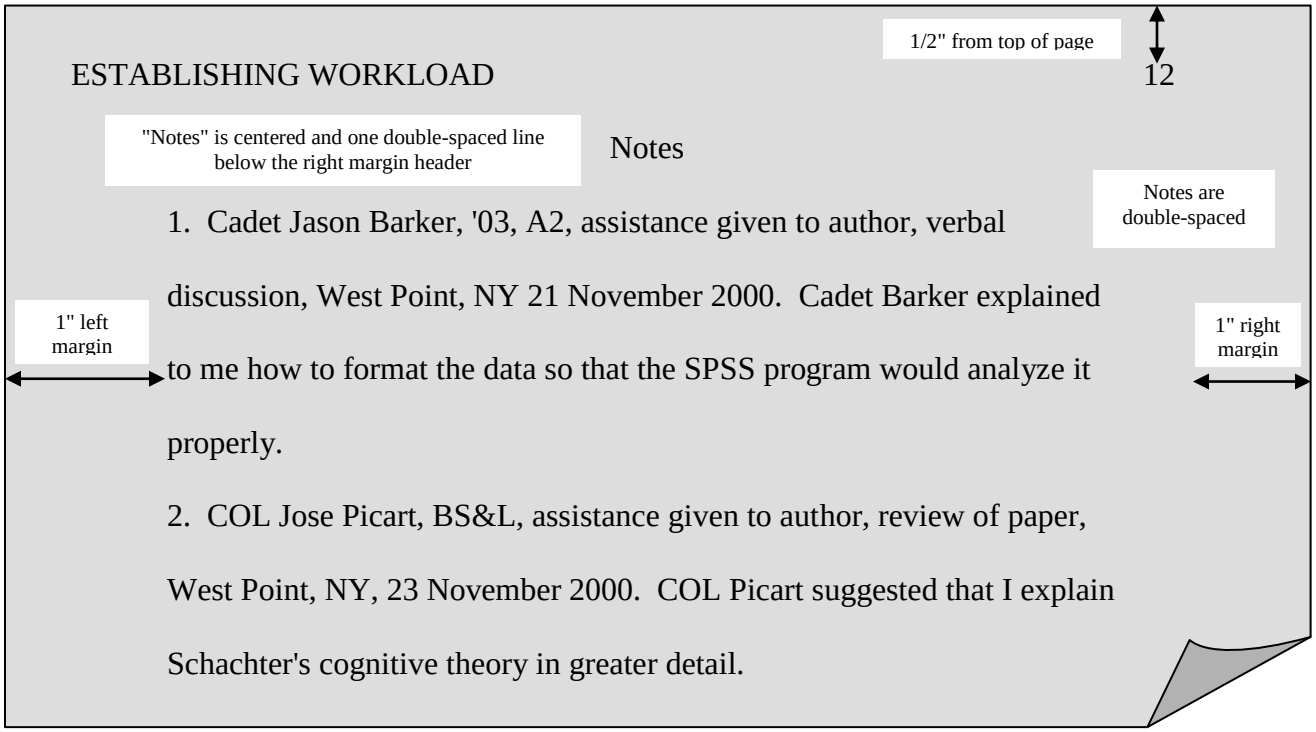
Notes

The primary reason for using notes in papers you submit for grade is to document collaboration. Neither the APA Publication Manual nor the APA section of the Little, Brown Handbook discuss the use of notes to document collaboration. As a result, you will have to refer to the Dean's Documentation of Academic Work (2010) for specific information.

We encourage you to collaborate! However, collaboration must be documented if the assistance you received is from a source other than the instructor who gave you the assignment or the members of your ***formal*** group. (A formal group is established by your instructor for the purpose of completing an assignment.) According to USMA policy, the following types of assistance also ***do not*** have to be documented: editing by others for spelling, grammar, and punctuation, and the assistance of computer spelling and grammar checkers. Help that you receive from your roommate, teammate, or any other acquaintance (unless they are members of your formal group) must be documented. Your documentation of the help you received must be specific. A note that says, "My roommate helped me with this assignment." is not acceptable. ***Any notes that appear in your Notes section must also be cited in your References section***.



Note: All collaboration documented in the Notes section also must be cited in the References section of your paper.

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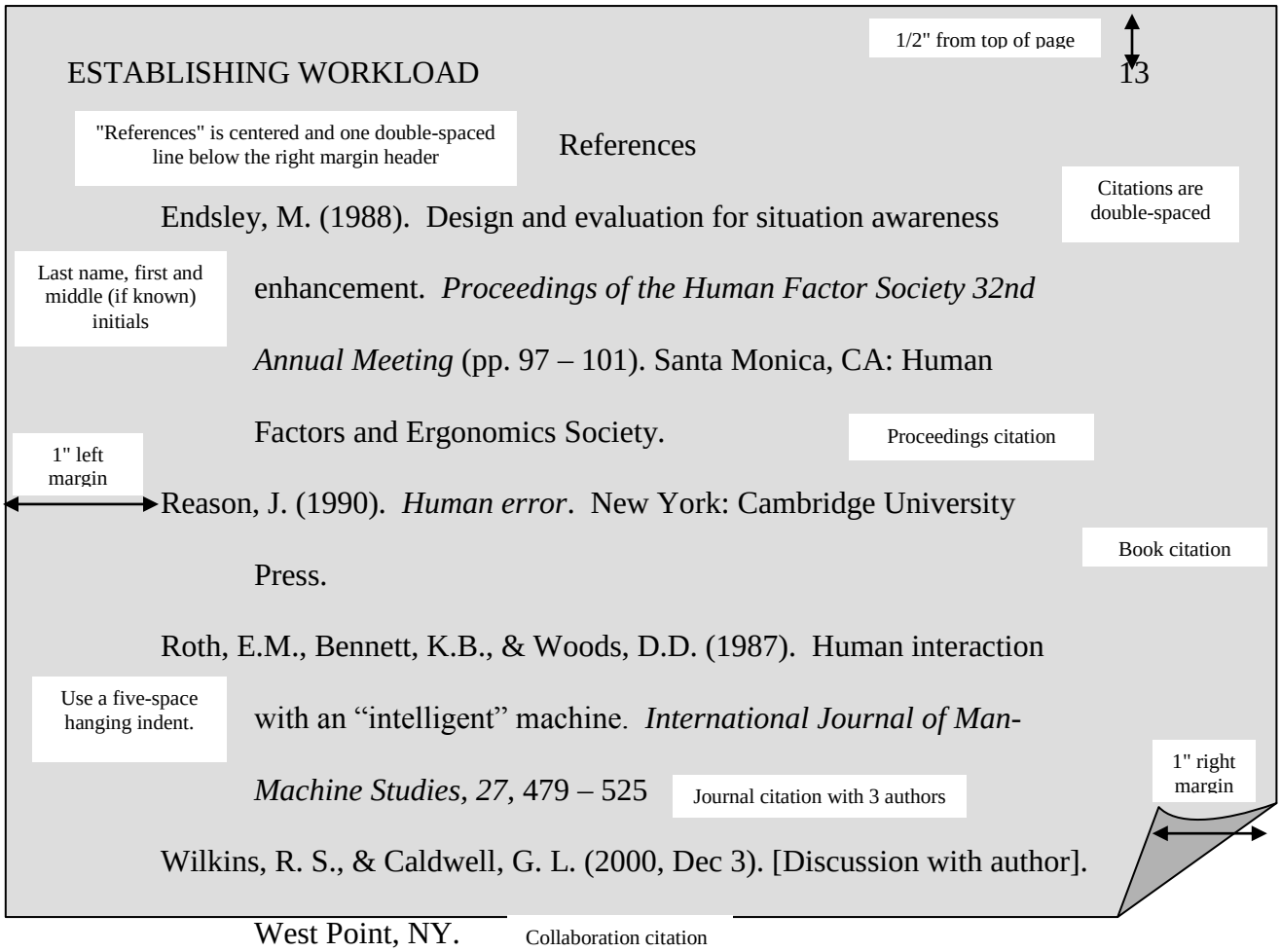
References

As mentioned previously, APA style requires that you use parenthetical references when citing sources in the text of your research paper. These parenthetical references serve as pointers to the full citation in the References section of your paper. The sixth edition of the APA Publication Manual provides guidance on citing various types of references. Refer to the APA Publication Manual for specific formatting information, but see the References example below for general guidance.

Sometimes you may need to cite an author's work presented in the work of another author. This situation is called a ***secondary citation*** or ***indirect source***. For instance, you read an experiment by Craig and Tulving in your Cognitive Psychology book that you want to cite. You should first attempt to get the original article in the library. If unable or not required to do so (due to time constraints, some in-class labs will not require you to get original citations), then you can still reference the article through secondary citation. In text, you would simply cite the study as usual, followed by the authors of the document that you actually read (e.g., "Craik and Tulving (as cited in Galotti, 1994) found that . . ."). Only the work that you actually read - in this case, Galotti, 1994 - would be listed in your References section.



Note: APA format calls for a "References" section, not a "Bibliography."

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Appendices

On some occasions, an appendix may be needed. This situation happens when detailed expository information would be distracting if inserted in the text. In Engineering Psychology reports, the most common appendix items are: nonstandard test materials, standardized set of instructions, complex description of apparatus, original computer programs, and other items that another researcher would need to replicate your work, but which the normal reader would find confusing in the text.

Note: MINITAB and SPSS statistics outputs are not included as an appendix.

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Tables

Tables are generally used when relationships among individual results (means, standard deviations, etc.) can best be understood outside of the text, as is the case when many individual entries exist. However, articles submitted to journals are conservative in their use of tables, since non-text copy is expensive. Use tables only when they enhance understanding! In addition, tables prepared for submission to a journal are unadorned. Your own tables should be so as well -- in most cases, decoration confuses clarity. Do not have them look like those in USA Today!!

Table 4

Mean Detection Time as a Function of Pattern and Training Level

	Training Level		
Pattern	Low	Intermediate	High
Standard	2.34	5.22	2.03
Symmetric	2.03	3.34	1.56
High-Density	1.52	2.27	2.67

For Engineering Psychology papers, tables will be inserted appropriately in the text, offset from their text references only as far as necessary to prevent splitting a table across two pages. This technique is in agreement with final manuscript method found in APA, so place the tables where they flow and look best.

Tables should *supplement* text. Every table should be referenced in the text describing what the table shows, but not so detailed that the table is unnecessary. Tables should be numbered sequentially with Arabic numerals (Table 1, Table 2, etc.). ***Put the table number and title at the top of the table***, left justified (see Table 4).

Note: Titles for Tables and Figures should always be self-explanatory.

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Figures

Graphs or pictures (called figures in scientific writing) are used only when the point you are trying to make favors graphic presentation. If your experiment consists of two groups and one measure, a graph would only convey that one score was higher than the other, which can be expressed just as effectively in text. Generally, use a graph for trends and relationships that are hard to express in words (e.g., ANOVA interactions). Ensure the axes are properly annotated and the measurement scale identified. Whether to to include a graph or not is your decision, but a good scientist will generally graph their data (whether used or not) to investigate trends noticeable to the eye, but not evident when examining mere numbers.

Kinds of Graphs. The computer SPSS graphics package available in the laboratory contains virtually every type of graph used by scientists. You will most likely use only three: the line graph, the *x*-*y* scattergram, and the bar graph.

The **Line Graph** is used to show a continuous change, such as a series of measurements taken over time. The independent variable (categorical in nature) is on the *x*-axis, and the dependent (continuous) is on the *y*-axis. Figure 1 is a line graph with one independent variable. In accordance with APA format, graphs are now plotted with means and some form of deviation or standard error bar to demonstrate spread of the data.

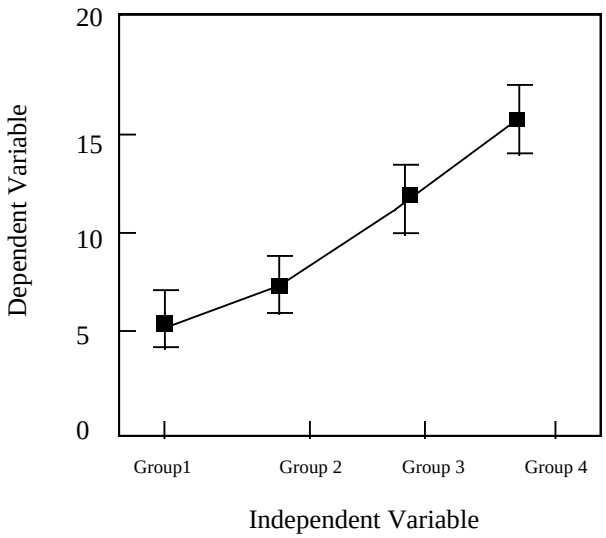

Figure 1. A line graph with four cases of a single IV with error bars.

Figure 2 shows a line graph with two independent variables. This graph is useful to show trends such as two main effects and an interaction. This graph would be very hard to portray in text or with a table. In this case, a picture is worth a thousand words. Notice the error bars are not present (although their inclusion is acceptable) as their inclusion might make it more difficult to interpret the graph. Again the decision is yours.

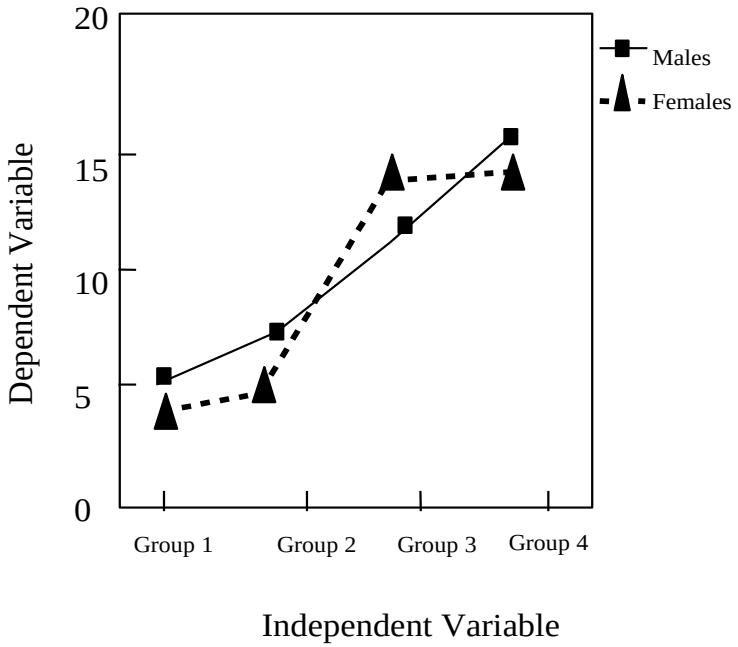

Figure 2. A line graph with two independent variables and no error bars.

Certain symbols are indicative of graphs. The first involves the "node symbols" ■ and ▲, which mark the points on the *x*-axis of actual measurements. Without the symbols, the reader could assume that all points on the line represented actual measures. Unless some compelling reason presumes the line represents continuous measure (e.g., heart rate), node symbology should be used. Use a legend for more than one line. (see Figure 2). Do not put a title on the top of the graph. APA requires figure captions be placed at the bottom of the graph.

The **Bar Graph** (see Figure 3) is generally best used for discrete categories (e.g., ANOVA, t-tests) when relative magnitude is important to convey rather than trends. Be sure to include error bars. **Caution:** The bar graph becomes unwieldy when too many variables are being displayed. Notice that a legend is appropriate with a bar graph.

A problem inherent in bar graphs is shading interactions. To differentiate between two variables, the shaded bars have two different cross-hatch patterns. But these patterns set up a visual rivalry called a moiré illusion. This illusion may cause a sort of induced motion or shimmering illusion, particularly if the lines are close together. Avoid fancy cross-hatching by using solid filled and colored bars. Figure 4 is a much better bar graph.

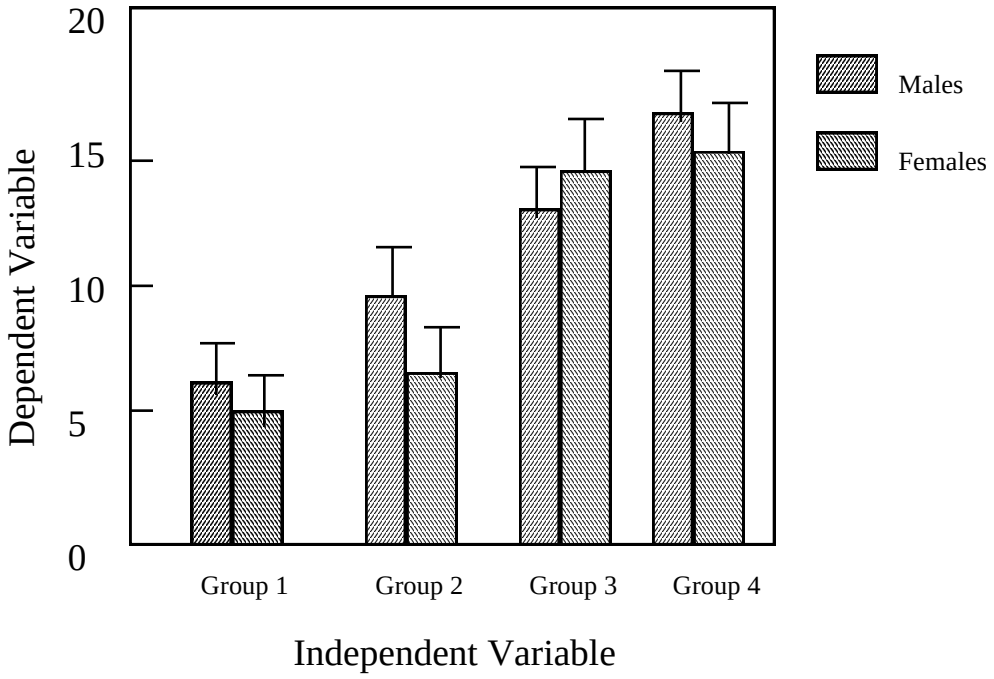

Figure 3. Bar graph with hatchure - poor coding.

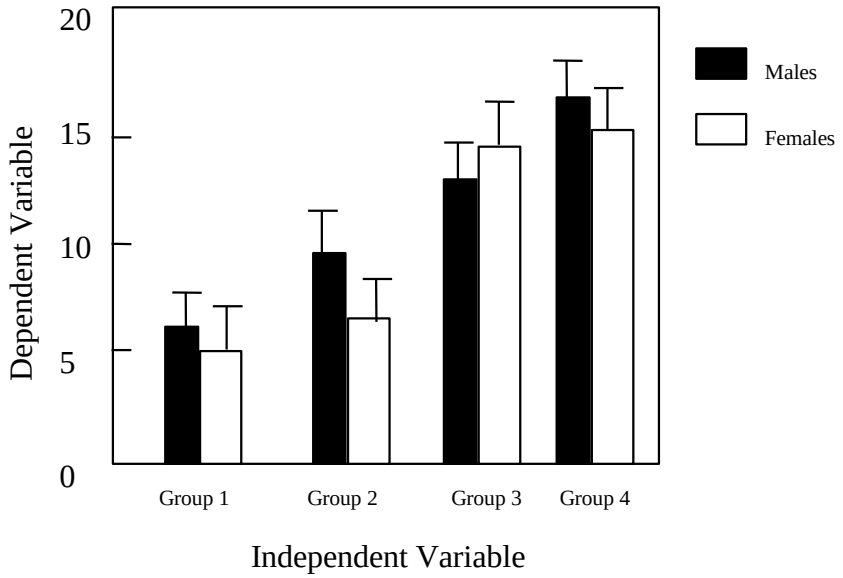

Figure 4. Bar graph with proper color coding.

The **X-Y Graph** (sometimes called a scatterplot or scattergram) has two continuous axes (unlike the line graph, which has a discrete *x*-axis (See Figure 5). The scattergram depicts the relationship of two continuous variables (frequently used for correlations and linear regression).

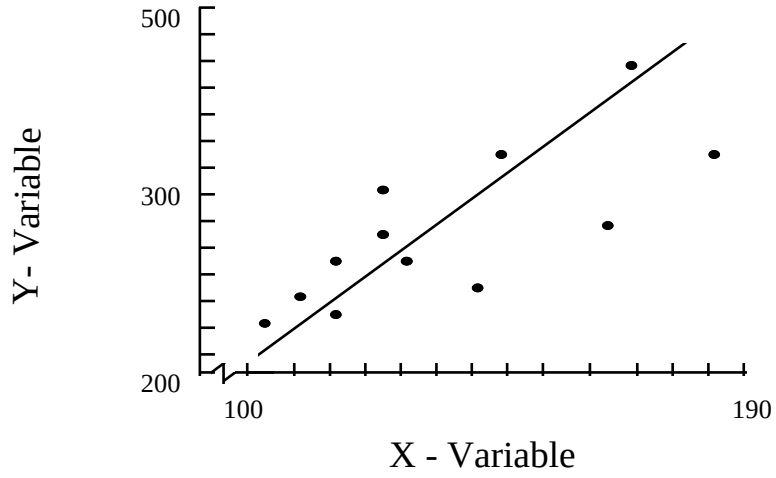

Figure 5. Example of x-y graph with the currently popular "range-frame" design.

Occasionally other graphs are used, but never inflict a pie chart on your instructor! Although aesthetically appealing, the pie chart provides little valuable information. Again, don't have your figures look like those in USA Today. Remember to present the graph with maximum content and minimal clutter. Be precise and concise!!

Pictures in a scientific report most commonly include examples of stimuli, drawings of special apparatus, histological drawings (showing locations of lesion sites), etc. All drawings will be in black ink only. The sole exception is the rare case of a stimulus whose color is critical, and necessary to convey this color information to the reader.

If you use a diagram, use a computer graphics package. The lab computers have several packages: PowerPoint, AutoCad, Mannequin, and Altia. For more complicated drawings or animation use AutoCAD or Altia. You can animate using Altia, which is the newest acquisition to the lab. These graphics packages will take training, but are worth it. Computer drawings should be printed to laser printers or the CAD plotter. All graphs and illustrations will be embedded in the text and labeled Figure XX, in sequence with all other figures.

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General Format Tips

All text should be in the same typeface: 12-point New Times Roman, left justified, just like this text. Unlike this text, the research paper is double spaced, and is not boldfaced or italicized.

Fonts

Use italics for words that are normally ***italicized***. By "normally italicized," we mean foreign words not in wide use (e.g., *a posteriori* but not etc., since the Latin *et cetera* is of such widespread use and is essentially an English phrase; a posteriori is a term limited to mathematicians and logicians, hence still "foreign"). Other allowable underlined words are those used to emphasize (". . . it is particularly interesting to note that none of the participants in the control group exceeded the criterion score"). In addition, test statistics are italicized in printed publications, hence, italicize them in your typescript (*t, F, M,* etc.). In previous manuals, writers were instructed to utilize underlining in place of italics. However, with the widespread use of word processors, italics are now used in paper submissions.

Section Titles and Headings

Titles and section headings are generally in upper/lower case. First-level headings are centered above the text. Major headings include the Title, Method, Results, Discussion, and References. Second-level headings (subsections such as the Participants, Apparatus, and Procedures - parts of the method section) are italicized and flush left. If you have third-level headings, indent them five spaces, italicize, and end with a period.

RUNNING HEAD 7

Second-level headings are flush left, & upper and lower case,.

Method

First-level headings are centered, bold, & in upper and lower case

Participants

Twenty volunteers, ranging in age from 18-35 (M = 25.5) participated. They received 5 bonus points toward their Introductory Psychology grade for ….

Apparatus

Computer complex. A Gateway P450 computer . . .

Third-level headings are typed in "sentence case," indented 5 spaces, bolded, and ended with a "."

In-Text Citation

The citation simply references the conclusions of an earlier experiment. APA style specifies the use of parenthetical references. The format for a parenthetical reference is: **(Author's last name, year of publication).** The page number is included after the year of publication when citing a quotation, i.e., **(Author's last name, year of publication, page number)**. For complete instructions regarding in-text citations and

references, please see the APA Publication Manual located in the Engineering Psychology library. Additional formatting information includes:

- For two authors use an "&" between their names.
- For three to five authors, separate their names by commas and use an "&" between the last two names. After the first citation of the source, you may use "et al." (i.e., Smith, et al., 1998).
- For more than five authors, use "et al." for all parenthetical references.
- Use "p." when referring to a single page number and "pp." for more than one page.
- When using the names of the authors in your text, you need only include the year in the parenthetical reference. Example: Barnes and Franklin (1994) found that …. Note that when the names of multiple authors are cited ***in the text***, the last two names are separated by "and" rather than "&."
- If you are referencing a specific quotation found in the publication you must include the page number in the citation.

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Multiple Experiments

In some instances you may need to report a series of two or more experiments that methodically develop your theory or test and eliminate alternative hypotheses. If so, separate methods/results/discussions for each experiment should exist. Mark the beginning of each experiment with a title (i.e., Experiment 1, Experiment 2, etc.) centered above the first paragraph.

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Evaluation of Written and Oral Reports

The Objectives of the Formal Report are numerous. First, this lab report process establishes a logical, scientific bias in problem solving and inquiry. Experience shows us that practice makes perfect. Writing lab reports forces you to review the planning and execution of the experiment, which increases the probability of applying this logical system to the solution of other problems.

Second, this process develops comprehensive writing and speaking skills. Although this approach may appear to be the Betty Crocker school of applied prose where elements are assembled automatically and mixed together like ingredients in a devil's food cake, it is, in fact, not as easy as it appears. For instance, you still have to understand the experiment and its procedures. You cannot bluff your way through a research paper or lab report. Additionally, oral presentations require you to logically and professionally present your work (for example, the course project in PL386 requires both a full written report and an oral defense). This approach is the Engineering Psychology cadre doing its part to support a major thread of the cadet experience--developing the best soldier-scholars for tomorrow's Army.

Evaluation Criteria

A thorough understanding of the evaluation criteria we use in the Engineering Psychology program will help you excel in everything from small lab reports in PL386 to the course project in PL490. We will use the criteria in this Handbook to evaluate nearly all of your oral and written work. There are a few instances in which other criteria will be used (i.e., case studies in PL488E). On these occasions your instructor will provide you with the criteria well in advance of the due date.

Learning to write research reports and to present your findings orally are developmental processes. Therefore we have structured the Engineering Psychology curriculum so that you learn to crawl, then walk, then run. In PL386, for example, you will submit your course project written report at least three times. The first submission will include just the Introduction. The second submission will include both the Introduction and the Method sections. And the third submission will include the Abstract, Introduction, Method, Results, and Discussion sections. Although the criteria will remain the same, we have every expectation that you will improve in your ability to write and speak effectively as you progress through the program.

General Standards

The evaluation standards we've established for you derive from the Academy's academic program goals as listed in the Dean's Educating Army Leaders for the 21st Century. One of the nine goals is effective (oral and written) communication. The pamphlet describes the four dimensions of communication as Substance, Organization, Style, and Correctness. The following chart describes how our evaluation criteria dovetail with the Dean's criteria.

Dimension	Description	Method of Evaluation
Substance	Factual accuracy, appropriate and adequate evidence, pertinent research, purposeful use of data, quality of ideas, propriety of attribution.	Lit review in Introduction should lead logically to your hypothesis and method. Discussion of data collected should address hypothesis and studies cited in Introduction.
Organization	Coherence, intelligibility, conciseness, orderliness, soundness of logical relationships, persuasiveness, completeness, method and form of presentation.	Use of APA format (Introduction, Method, Results, Discussion). Internal consistency among sections of research paper.
Style	Fluency of language, precision of vocabulary, appropriateness of tone, effectiveness of sentence structure, use of active verbs, imaginative use of language.	Style should be appropriate for scientific writing. Use active voice. Just the facts. Flowery prose is not appropriate. Proposal papers are written in future tense. Final research papers are written in past tense.
Correctness	Observance of appropriate usage, grammar, spelling, punctuation, documentation format, and other conventions of educated discourse.	Paper should be free of all spelling, grammar, and punctuation errors. Correct use of parenthetical references, reference list, and notes.

Written and Oral Evaluation Criteria

Appendix C lists the evaluation criteria for written reports. Appendix D lists the criteria for oral reports and includes tips for preparing your oral presentation. Although the criteria are organized around the APA format (Abstract, Introduction, Method, Results, and Discussion), they support the four dimensions of communication described on the previous page. You should use these criteria as a checklist to ensure you have covered all the necessary topics for each section of your report. Oral reports will include visual aids prepared with PowerPoint presentation software.

Note: Content is much more important than slick slides. We will not be impressed with 'bells and whistles' unless they augment the presentation. In most cases, however, they detract from the presentation.

Critical Evaluation of Research Articles

The ability to critically read and evaluate the research of others is an absolutely essential skill for Engineering Psychologists. Critical analysis requires practice and is a crucial program goal of the Engineering Psychology Program. Appendix E provides you with a checklist for critically evaluating research articles. Follow it closely and you will be sure to perform a thoughtful, systematic review of the scientific literature.

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APPENDIX A

Bloom's Taxonomy

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Bloom's Taxonomy of Key Words

The following list of key words and their definitions is provided to promote an understanding of exactly what is required by Lesson Objectives (LOs), Performance Objectives (POs), and examination questions. The key words are presented in order of an ascending hierarchy. Those terms that require little original thought are presented first. When evaluating student performance, the instructor assumes the lower level skills have been mastered in Performance Objectives that are stated at a higher level. It is not necessary to memorize this list of key words.

COGNITIVE DOMAIN (Level of Understanding)	**ACTION VERBS WITH DEFINITIONS**
KNOWLEDGE: Requires recall of specific information concepts and theories from reading assignments, films, class presentations.	**Identify:** To recognize and indicate specific information such as definitions, names principles, etc.
	List: To reproduce an itemized set of terms, principles or things in a prescribed order if appropriate.
	Define: To state the meaning of a term.
	Describe: To give a detailed account of a theory, concept, thing or an event.
	Differentiate: To give a detailed account of distinctions between related theories, concepts, things, or events.

COGNITIVE DOMAIN (Level of Understanding)	ACTION VERBS WITH DEFINITIONS
COMPREHENSION: Requires, in addition to recall, demonstrated An awareness of the implications of reading assignments, films, and class presentations. Comprehension subsumes knowledge of the material.	**Summarize**: To express in concise form without losing key ideas.
	Illustrate: To make clear and intelligible a term, concept, or theory by means of figures, examples, comparisons, etc.
	Infer: To draw conclusions or make generalizations suggested by a specific set of data.
	Classify: To place concepts, examples, terms, objects, words or situations in categories according to specific criteria.
	Relate: To bring into logical or natural association by stating the connection between concepts, theories, terms, issues, etc.
	Predict: To use a concept, theory or principle to forecast an outcome.
APPLICATION: Requires the use of abstractions from reading assignments, classes, and films to solve particular problems. It includes the ability to predict a probable outcome. Application subsumes comprehension of the material to be applied.	**Apply**: To use learned material such as rules, concepts, principles or theories to solve a problem in a given situation.
	Explain: To use a given theory or concept to account for the occurrence of a given phenomenon.

COGNITIVE DOMAIN (Level of Understanding)	ACTION VERBS WITH DEFINITIONS
ANALYSIS: Requires breaking a situation, issue, or event into its constituent elements so that the assumptions or components are made clear and the relationships between them are made explicit. Analysis subsumes comprehension of the material to be analyzed.	**Analyze**: To break down a situation, issue, or event into its component parts, summarizing the relationships among components.
	Compare: To state similarities by bringing theories, concepts, paradigms or principles together for the purpose of demonstrating likeness.
	Contrast: To state dissimilarities by bringing theories, concepts, paradigms, or principles together for the purpose of demonstrating unlikeness.
SYNTHESIS: Requires combining elements or parts so as to form a new whole.	**Synthesize**: To combine separate elements into an orderly, functional, structured new whole.
	Design: To conceive, contrive, or create a plan which draws on two or more elements and has reasoned purpose or intent.
EVALUATION: Requires judgment about the value of material based on quantitative or qualitative criteria.	**Discuss**: To state arguments for and against an issue, concept, or term.
	Evaluate: To form a conclusion as to whether a concept, principle theory, etc., is right, just or valid when compared against definite criteria established by the instructor or provided by the student.

(Return to Table of Contents)

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APPENDIX B

Research Forms

&

Instructions

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Approval Procedure for Use of Human Participants in Research

In our department, we maintain a research participant pool of cadets who want to get extra credit for their PL100 class. This pool was established to supply participants to the researchers in the department and is maintained according to the USMA guidelines in using human participants. There are circumstances when PL100 students are not the appropriate participant pool for the research project being conducted. In either case, the management of participant treatment must be watched closely. Accordingly, strict steps must be followed.

***** In most cases, it will take less than three weeks, after submission of a request to the Research Coordinator, to receive approval from the Human Subjects Research Review Board.** Examples of all the necessary forms are included in this appendix. You may also find them on sharepoint.

Procedure for Research Project Approval

Any human participant data collected by faculty or cadets must undergo review. Benign research involving interviews, surveys, or desk-top simulations will undergo Exempt review. Research that involves risk to participants, either due to the nature of the questions and/or intervention, will undergo Non-Exempt or Expedited IRB review. Retrieve the appropriate IRB documents via sharepoint. Your instructor will provide you with the link.

1. Complete CITI Training: https://www.citiprogram.org/Default.asp
    a. The institution you are affiliated with is: **U.S. Army Human Research Protections Office (AHRPO)**
    b. Training that you need to complete:
        i. If this is your first time obtaining your CITI training you will need to complete the: **Social & Behavioral Investigators & Research Personnel, Basic Course.** Note it will take you 2-3 hours to complete the course, afterwards save a copy of your certification. Note, keep a copy for yourself, you will need to include a copy of your certification with every new protocol you submit. Your certification is valid for two years.
        ii. If you have completed the training within the past two years, you may complete the **CITI Refresher Course.** Note it should take you under an hour to complete.
        iii. All faculty, colleagues, and cadets involved in the project need to complete CITI training.

2. Go the Sharepoint IRB site to retrieve paper work. Your instructor will provide you with the link.

3. Complete **USMA_Exempt_Request_Form_Template_Apr_09** found in **Shared Documents > Exempt Protocol Documents and Procedures**. Note, your instructor should be listed as the Principal investigator and as such should sign Page 9.

4. Complete **Exempt Consent Form** found in **Shared Documents > Exempt Protocol Documents and Procedures.**

5. Complete **Exempt Consent Form** found in **Shared Documents > Exempt Protocol Documents and Procedures.**

6. Submit a copy of your Curriculum Vitae or Resume. Basic information should include education, academic positions (include courses taught), previously held jobs/positions and duty descriptions, and publications if any. Cadet transcripts are sufficient.

7. All documents should be scanned and combined into 1 PDF document. The single PDF document should be emailed to the Lab Director, Ericka Rovira, Ph. D. If you have any questions regarding the instructions email or call the Lab Director for clarification x5902.

8. Researcher(s) coordinate for laboratory/classroom space as needed for their project.

9. Research requiring human participants will be announced and managed via the sona-system. It is the responsibility of the Researcher(s) to post, update, and manage all research information in the sona-system. Instructions for posting and managing research information in sona-system can be found on sharepoint. Your instructor can provide you with the link.

10. Researchers complete their data collection. Researchers must debrief all participants and update their Research Participation Points in the sona-system.

REMEMBER:

1. **ALL STUDIES REQUIRE INSTITUTIONAL APPROVAL**, regardless of what *kind* of study you are doing.

2. Plebes **cannot** participate in data collection during other mandatory activities (i.e., formations, classes, evening study period, etc.) and their participation may not last more than 165 minutes.

3. Data collection must be done in an academic setting (classroom, laboratory, etc.) unless other arrangements are approved by the Human Research Protection Program (HRPP).

4. Data collection **may not begin** until project approval has been given.

5. Informed consent forms are to be turned in to the Psych Tech, Ms. Vasiliki Georgoulas, **NLT Lesson 40** of the semester during which the research is conducted.

6. If, during data collection, the cadet participant does not arrive for his or her scheduled time slot, NO adverse actions will be taken. However, the researcher will NOT award Research Participation Points in the sona-system. If the researcher fails to arrive but the participant has kept his or her scheduled time, the participant will notify his or her PL100 instructor. The instructor will inform the faculty member advising the cadet researcher that the researcher did not show. The faculty advisor will determine what action should be taken, and the researcher will award the participant ONE Research Participation Point in the sona-system.

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USMA Human Research ProtectionProgram (HRRP)
Example of Request for Exemption (p. 1 of 9)

US Military Academy (USMA) Human Research Protection Program (HRPP)

Request for Exemption

(See USMA REG 70-25 for the use of this form,)

1. Study Title: The development of character strengths using introductory psychology concepts
2. Proposed Start Date: 30-Apr-10 Proposed End Date: 29-Apr-11
3. **Principal Investigator (PI) Information**

Human Research Training Completed ☒

First Name: **Victor**	Middle Initial: **M**	Last Name: **Deekens**	
Degree(s) & Field(s) of Study: MA Educational Psychology, Measurement, and Evaluation			
Job Title: **Instructor**		☒ Military ☐ Civilian	
Department/Division/Branch: **Dean/BS&L**		Major Activity Directorate:	
Work Address: Department of BS&L, West Point, NY 10997		Affiliation: ☒ USMA Faculty or Staff ☐ Cadet ☐ DoD Employee (Not USMA) ☐ Contractor ☐ Other, specify:	
Work Phone: 8459385024	Fax: 2236	Mobile: 8082950476	Email: victor.deekens@usma.edu

4. **Study Contact Information** (complete if primary contact is different from PI) ☒ **NA**

Human Research Training Completed ☐

First Name:	Middle Initial:	Last Name:	
Degree(s) & Field(s) of Study:			
Job Title:		☐ Military ☐ Civilian	
Department/Division/Branch:		Major Activity Directorate:	
Work Address:		Affiliation: ☐ USMA Faculty or Staff ☐ Cadet ☐ DoD Employee (Not USMA) ☐ Contractor ☐ Other, specify:	
Work Phone:	Fax:	Mobile:	Email:

5. **Associate Investigators Involved in Study** *(insert additional rows if needed)*
Note: Associate investigators include all individuals responsible for the design or conduct of the study.

Name (First, Middle, Last)/Degree	Department/ Division or Affiliation	Role In Project	Training Completed
Daniel, S, Hall	Dean / BS&L	Associate PI	☒ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No
	/		☐ Yes ☐ No

6. Study Information:

A. Research Determination

(1) Study Objectives: *Describe specific objectives of this study. What is the study designed to accomplish?*

This study seeks to evaluate the efficacy of a class project assigned as part of an introductory psychology course for first-year West Point Cadets. The study will discern whether this in-class project, which is based on Peterson and Seligman's (2004) 24 character strengths and virtues study, enabled Cadets to achieve deeper self-awareness, and effectively encouraged further development of one of their character strengths using course content. This assignment is already assigned as the instructor project in two sections of PL 100. No additional assignment will be given. The grades or written work completed by the students will not be part of this study. This study will only examine the students' assessment of the project as shown on the attached survey. These assessments will be collected as part of the instructional process in order to improve the project for future semesters regardless of this study.

(2) Synopsis of the research (Limit to 800 words). *Provide a brief description (in layman's terms) of your research design and planned use of human participants. This is similar to an abstract of a research paper.*

Approximately 125 fourth class cadets (freshmen) from the United States Military Academy at West Point will serve as participants in this study. All participants will be recruited from 2 sections of an introductory psychology course. Students will not be compensated for their participation in this study. Each participant will complete a Likert scale survey with the option to add additional comments. The survey will ask him or her to evaluate the project in terms of 1) how effective the project was at developing self-awareness 2) how much he or she enjoyed the project 3) how effectively the project aligned with future goals, both at West Point and as Army officers 4) how effective he or she was at applying introductory psychology concepts to the development of a chosen character strength.

(3) Does the investigator intend to publish the results or present the results in a public forum? *Note: Intention to publish or present results does not necessarily define a project as research.* ☐ No ☒ Yes

(4) Is learning something for the benefit of people, other than the participants, a major goal of this activity? ☐ No ☒ Yes

If "Yes", specifically describe how the use of the results will benefit people or society.

If this project, or those similar to it, can help college-age students enhance one of the 24 characters strengths then these types of projects can be incorporated into more introductory level psychology courses.

B. Human Subject Determination: Will investigators collect any information about the study participants (attitudes, opinions, characteristics, demographics, traits, actions/reactions, etc.)? ☐ No ☒ Yes

(1) If "Yes", how will investigators collect the information?

i. ☒ Interaction *(Example: Surveys, Interviews, E-mail correspondence, etc.);* or

ii. ☐ Intervention *(i.e. blood draw, electrodes, wearing or use of equipment, designed exposure to environmental conditions, etc.)* ; or

iii. ☐ Secondary Data

(2) If "Yes", is any of the collected information individually identifiable private information? ☒ No ☐ Yes

C. Does the subject population involve any vulnerable populations? (Mark all that apply.)

☒ Cadets (Note: See Appendix E, USMA REG 70-25 for special procedures that apply when using cadets)

☐ Pregnant Women or Fetuses (Note: More restrictive exemption criteria are required for research involving pregnant women or fetuses. See 45 CFR 46, Subpart B for more information.)

☐ Prisoners (Note: More restrictive exemption criteria are required for research involving prisoners. See 45 CFR 46, Subpart C for more information. **The involvement of prisoners of war as human subjects of research is prohibited [DoDD 3216.02, para. 4.4.2]**)

☐ Children (Note: Research involving children has more restrictive exemption criteria. For example, exemption category #2 is not used with children, except for procedures involving observation of public behavior. See 45 CFR 46, Subpart D for more information)

☐ Military Members (Soldiers, Airmen, Marines, or Sailors)

☐ Employees of the principal or associate investigators

☐ Cognitively impaired persons

☐ Illiterate persons

☐ Non-English-Speaking Persons

☐ Other potentially vulnerable participants: Who?

D. Does this research involve any approved or unapproved FDA regulated items (including foods, dietary supplements that bear a nutrient content claim or a health claim, infant formulas, food and color additives, drugs for human use, medical devices for human use, biological products for human use, and electronic products.)

☐ No ☐ Yes (Note: FDA-regulated research has more restrictive exemption criteria.)

E. Does this study involve the use of deception on one or more of the participants?

☐ No ☐ Yes (Note: The IRB must review studies using deception techniques)

F. Foreseeable Risks. State any foreseeable risks this study may impose on human subjects. This includes physical, emotional, economic, and legal risks, and the risks of invasion of privacy and breach of confidentiality.

Risks to participants will be minimal. This study will examine only de-identified data collected anonymously from consenting participants.

7. CATEGORIES OF EXEMPTION

Check "**Yes**" and complete the corresponding section for each of the following six categories of exemption that apply. Leave all other categories unchecked. If none of the categories applies, you may need to complete a research protocol IAW USMA REG 70-25 and submit to the IRB Administrator for IRB review.

CHECK "YES" FOR AT LEAST ONE OF THE FOLLOWING:

A. 32 CFR 219.101(b)(1):

☒ Yes **EVALUATION/COMPARISON OF INSTRUCTIONAL STRATEGIES/CURRICULA**

Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as

(i) Research on regular and special education instructional strategies, or

(ii) Research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

1. **Educational Setting:** *Describe the educational setting in which you will the research. Include all geographical locations involved in the study.*

   This research study will gather information at the United States Military Academy at West Point. Participants are approximately 125 first-year Cadets assigned to either of two sections of an introductory psychology course.

2. **Educational Practices:** *Describe, in sufficient detail, the educational practices you are studying.*

   This research will explore the efficacy of one project designed to allow Cadets to achieve deeper self-awareness by developing a self-selected character strength.

Note: FDA-regulated research does not qualify for this exemption.

B. 32 CFR 219.101(b)(2):

☐ Yes **SURVEYS, INTERVIEWS, EDUCATIONAL TESTS, OR OBSERVATION OF PUBLIC BEHAVIOR**

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:

(i) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and

(ii) Any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

1. **Recording Procedures:** *Describe the procedures used to collect the data. Provide a detailed description that includes locations (physical locations or websites), instruments used to record (questionnaires, data collection sheets, etc.), methods used to record (audio, video, one-on-one interview , focus group interviews, etc), and who will be recording the information.*

2. **Data Management:** *Describe how confidentiality will be maintained. In other words, how the data will be de-identified, stored, or disposed. Provide a detailed description that includes locations that the information will be stored, who will have access to the information, how long the information will be stored, if and how the data will be destroyed after use, if and how the data will be coded, etc..*

3. **Attach all proposed research instruments (e.g. tests, questionnaires, surveys, interview outlines or scripts, data collection sheets, etc) to this application.**

4. **Intended Dates of Data Collection (d-MMM-yy): Start:** ☐ **End:** ☐

5. **Will the investigator record public behavior that may involve sensitive aspects, such as illegal conduct, illegal drug use, sexual behavior, hate mongering, or illegal use of alcohol?**

   ☐ NO ☐ YES (If "YES", complete a research protocol and submit to the IRB Administrator.)

6. **Before a test, survey, or interview begins, will you inform participants that their participation is voluntary and that they may withdraw from participation at any time?**

   ☐ NO ☐ YES

Notes:

- When the research involves children as subjects this exemption must be limited to educational tests (cognitive, diagnostic, aptitude, achievement) and observation of public behavior when the Investigators do not participate in the observed activities.
- Research that involves observation of public behavior when the investigators participate in the observed activities cannot be granted an exemption.
- FDA-regulated research does not qualify for this exemption.

C. 32 CFR 219.101(b)(3):

☐ Yes **SURVEYS, INTERVIEWS, EDUCATIONAL TESTS, OR OBSERVATION OF PUBLIC BEHAVIOR OF PUBLIC OFFICIALS OR CANDIDATES FOR PUBLIC OFFICE**

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior that is not exempt under the previous paragraph if:

(i) the human subjects are elected or appointed public officials or candidates for public office; or

(ii) Federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

Explanation: *Describe how subjects may be identified or are at risk, or state the federal statute that allows the confidentiality of the subject to be maintained throughout the research and thereafter.*

Note: FDA-regulated research does not qualify for this exemption.

D. 32 CFR 219.101(b)(4):

☐ Yes **COLLECTION OR STUDY OF EXISTING DATA**

Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are (mark all that apply):

☐ publicly available; or

Public Source *(include agency/person and location/website):*

☐ if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. (See paragraph 7 of this form.)

Recording Procedures*: Describe how the data are collected, stored, and de-identified. Include the start date and end date of the data extraction.*

Notes:

- Enclose a description of all data variables to be collected and/or a copy of the data collection sheet.
- To qualify for this exemption, the data, documents, records, or specimens must be in existence before the project begins.
- FDA-regulated research does not qualify for this exemption.

E. 32 CFR 219.101(b)(5):

☐ Yes **PUBLIC BENEFIT OR SERVICE PROGRAMS**

Research and demonstration projects which are conducted by or subject to approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine:

(i) Public benefit or service programs;

(ii) Procedures for obtaining benefits or services under those programs;

(iii) Possible changes in or alternatives to those programs or procedures;

(iv) Possible changes in methods or levels of payment for benefits or services under those programs.

Proof of approval by Federal Department/Agency Head is attached. ☐Yes ☐No

Notes:

- This exemption applies to federally funded projects only and requires authorization or concurrence from the funding agency.
- This exemption category does not apply if there is a statutory requirement that this project be reviewed by an IRB or if the research involves physical invasion or intrusion upon the privacy of subjects.
- FDA-regulated research does not qualify for this exemption.

USMA Human Research ProtectionProgram (HRRP)
Example of Request for Exemption (p. 6 of 9)

F. 32 CFR 219.101(b)(6) and 21 CFR 56.104(d):

☐Yes **FOOD QUALITY EVALUATION & CONSUMER ACCEPTANCE STUDIES**

Taste and food quality evaluation and consumer acceptance studies,

(i) If wholesome food, without additives are consumed or

(ii) If a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the FDA or approved by the EPA or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

Explanation: *Describe the type of food to be tasted or ingredient to be evaluated. State whether it is FDA-, EPA-, or USDA-approved.*

USMA Human Research ProtectionProgram (HRRP)
Example of Request for Exemption (p. 7 of 9)

8. Secondary Data Collection (see Appendix E, USMA REG 70-25). For an exemption, an investigator (with proper authorization) may inspect identifiable records, but may only record information in a non-identifiable manner.

Will existing **Personally Identifiable Information (PII)** be accessed in the course of preparing for this research?

☐ Yes ☒ No If "No", skip to the Conflict of Interest Declaration (paragraph 9).

A. STATEMENT OF AFFIRMATION

If PII is accessed (used) in the course of preparing for this research the following 3 conditions must be met to allow for the access (use) of PII as "preparatory to research":

1. The use or disclosure of the PII is solely for the purpose of this research project.
2. The PII is not removed from the agency or department that controls databases or files in which an individual accesses, uses or discloses the PII.
3. The PII is necessary for the purpose of this research study.

B. DATA SETS. The above 3 conditions require that a data set be created from the existing PII. What type of data set will be created?

☐ De-identified Data Set ☐ Limited Data Set (Complete a "Data Use Agreement")

The USMA Data Use Agreement* below sets forth the terms and conditions under which the USMA Department or Agency will allow the use and disclosure of a limited data set to the Data Recipient (Principal Investigator).

*A "Data Use Agreement" is required to disclose the limited data set to an Individual or an Institution outside of the department or agency. Please submit this agreement to the department or agency that controls the information.

C. INTERNAL USMA DATA USE AGREEMENT ☐ **NOT APPLICABLE**

In my capacity as the Principal Investigator for the research project that is the subject of this Application as it may be amended or supplemented from time-to-time (the "Research Project"), I hereby agree that the limited data set:

- will only be used for purposes of preparing for and conducting the Research Project.
- will not be disclosed for any purpose other than the research project or as required by law.
- will only be used by the investigators listed on page 1 or any of the individuals listed below:

Name	Title

(Check each box)

☐ I will maintain appropriate safeguards to prevent use or disclosure of the limited data set other than as provided for by this Agreement.

☐ I agree not to identify the information contained in the limited data set or contact any individual

☐ I will report to the USMA Human Protections Administrator at (845) 938-7382 (DSN 688-7382) any use or disclosure of the limited data set not provided for by this agreement, of which I become aware, including without limitation, any disclosure of PII to an unauthorized subcontractor.

☐ I understand and agree that I am responsible for requiring that any agent, including a subcontractor, to whom I provide the limited data set, agree in advance and in writing to the same restrictions and conditions on use and disclosure of the limited data set that apply through this agreement to me.

USMA Human Research ProtectionProgram (HRRP)
Example of Request for Exemption (p. 8 of 9)

9. Conflict of Interest Declaration

Assessment should include anyone listed as Principal Investigator, or other research personnel on page 1 of this application. Please note that the thresholds of ownership described below apply to the aggregate ownership of an individual investigator, his/her spouse, domestic partner and dependent children (e.g., if an investigator, his/her spouse, domestic partner and dependent children own together $10,000 or 5% worth of equities in the sponsor, it should be reported below). Do not consider the combined ownership of all investigators.

One or more investigators associated with this project have or will receive (check all that apply):

☐ Compensation where the study outcome affects the value

☐ A proprietary interest in the tested product included but not limited to, a patent, trademark, copyright or licensing agreement, or the right to receive royalties from product commercialization

☐ Any equity interest in the sponsor or product whose value cannot be readily determined through preference to public prices (e.g., ownership interest or stock options)

☐ Any equity interest in the sponsor or product that exceeds $10,000 or 5%

☐ Significant payments or other sorts with a cumulative value of $10,000 made directly by the sponsor to any of the investigators listed on page 1 of this application as an unrestricted research or educational grant, equipment, consultation or honoraria

If any of the above boxes are checked, the investigator must complete and submit a Research Protocol with a "Conflict of Interest Disclosure Form" to the IRB Administrator. The Disclosure Form and the protocol must be reviewed by the USMA IRB of Record.

☒ Investigators have no known conflicts of interest with this proposed project.

USMA Human Research ProtectionProgram (HRRP)
Example of Request for Exemption (p. 9 of 9)

Investigator Assurance and Compliance Statement

As the PI of this study, I agree to:

- Accept responsibility for the scientific and ethical conduct of this project IAW responsibilities stated in USMA Regulation 70-25;
- Ensure all investigators and key study personnel have completed the USMA human subject protection training requirements;
- Submit for approval any additions, corrections or modifications to this research project to the EDO prior to the implementation of any changes; and
- Start the project only after I receive a final written exemption from the EDO.

Principal Investigator's Signature — Date: 27APR10

Human Research/Exempt Determination
(This section completed by the EDO)

I certify that I reviewed this research project in accordance with USMA REG 70-25. This study is determined to be:

☐ Not Human Research

Justification:

☐ Exempt IAW 32 CFR 219.101(b)___
from review by the IRB and further procedures outlined in USMA REG 70-25.

☐ Not Exempt from review by the IRB and further procedures outlined in USMA REG 70-25.

Justification:

Signature of Exempt Determination Officer — Date

Printed Name:_____

Project Control Number: _____.

USMA Human Research ProtectionProgram (HRRP)
Volunteer Consent Form (p. 1 of 2)

VOLUNTEER CONSENT FORM

I, _____ Cadet number _____ having full capacity to consent and having attained my _____ birthday, do hereby volunteer to participate in the research protocol **Title of Study** under the direction of **PI Name** conducted at **West Point, NY**.

The implications of my voluntary participation; the nature, duration and purpose of the research study; the methods and means by which it is to be conducted; and the inconveniences and hazards that may reasonably be expected have been explained to me by one of the assistant researchers.

I have been given an opportunity to ask questions concerning this investigational study. Any such questions were answered to my full and complete satisfaction.

I understand that I may at any time during the course of this study revoke my consent and withdraw from the study without further penalty or loss of benefits. My refusal to participate will involve no penalty or loss of benefits to which I am otherwise entitled.

PART B - EXPLANATION OF WHAT IS TO BE DONE

This experiment is intended to examine **Insert Verbiage**. During the experiment **Insert Verbiage** will occur.

Participation is entirely voluntary. You may refuse to participate or withdraw from the study at any time without penalty or loss of benefits to which you are otherwise entitled.

PROCEDURES:
You are reminded that your answers are confidential and will in no way be released or used against you in any way and you may stop the experiment, including immediately after or even during with no penalty, reprisal or prejudice. You will be treated in accordance with the APA standards regarding ethical principles (IAW 2002 Ethics Code).**You do not have to complete any portion of the research that you do not wish to.** If you do not provide informed consent you will not be allowed to proceed with the experimentation.

Insert verbiage of your specific procedures from beginning to end. You will have the opportunity to ask for clarification if any aspect of the task is confusing.

POTENTIAL BENEFITS:
There are no benefits in participating in this study other than you are helping scientists learn more about the effects of **insert verbiage**.

RISKS, INCONVENIENCES, AND DISCOMFORTS: The experiment does not require you to perform actions beyond those which you would probably experience in everyday life. **Insert more verbiage if required.**

What steps are being taken to ensure my privacy?
All information you provide will be kept confidential. Written information (e.g., surveys, forms, etc.) is kept in a locked file cabinet, behind a locked door. A numerical code will be used for all electronic information (e.g., performance data) so that your identity cannot be linked with the data file.

COMPENSATION: You will not be paid for your participation in this study. You will be given a time credit to give to your instructor so that you will receive extra credit in your PL100/150 class.

CONFIDENTIALITY OF RECORDS: All records will be kept in a confidential form. Otherwise, only the researchers conducting this study will have access to the records from this study. Information gained from this study may be used as part of a scientific publication, but you will in no way be personally identified. Complete confidentiality cannot be promised, particularly for military personnel, because information bearing on your health may be required to be reported to appropriate medical or command authorities.

You are encouraged to ask any questions, at any time, that will help you to understand how this study will be performed and/or how it will affect you. **You may contact PI Name and contact Info.**

Also if you have any questions or concerns about this study or your rights as a study subject you may contact Dr. Linda Mallory, (845) 938-7385.

IF THERE IS ANY PORTION OF THIS EXPLANATION THAT YOU DO NOT UNDERSTAND, ASK THE INVESTIGATOR BEFORE AGREEING TO PARTICIPATE IN THIS STUDY.

You will be given a signed and dated copy of this consent document for your records.

SIGNATURE OF VOLUNTEER	DATE	PRINTED NAME OF VOLUNTEER

Name of person administering consent: _____

Signature of person administering consent: _____ Date: _____

(Return to Table of Contents)

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APPENDIX C

Written Report
Evaluation Criteria

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Evaluation Criteria
WRITTEN REPORT

NAME_____ Total Score (Out of ___Pts.) _____
_____
_____

1. TITLE PAGES (_____) _____
IAW p. 9-10 of this handbook?

2. ABSTRACT (_____) _____
Approx 120 words?
Summary of your research?
Background, task/methodology, variables defined?
Results concisely summarized?
Important theoretical/practical implications cited?
IAW p. 11 of this handbook?

3. INTRODUCTION (_____) _____
Brief, broad background (why interesting/important?)
Purpose of current research?
Lit review.
Psych Theory lit?
Domain lit?
Methodological lit?
(What's already been done on the topic? Their results?)
Logically support/justify your research, your design, method, hypothesis
State the hypothesis(es)
IAW p.12-13 of this handbook?

4. METHOD (_____) _____
Participants. Detailed description of participants used.
Are demographics of participants that could affect results presented?
What were the conditions of participation?
Apparatus. (Detailed enough so that someone else could understand and replicate the study)
Procedures. (Detailed enough so that someone else could understand and replicate the study)
IAW p. 13-15 of this handbook?

5. RESULTS AND ANALYSIS (_____) _____

Type of analysis used?
Descriptive Statistics
Inferential Statistics (Main effects, interactions)
Qualitative Data Analysis (if appropriate)
Avoid discussion of theory/practical applications?
IAW p. 15-18 of this handbook

6. DISCUSSION (_____) _____

Address support of hypothesis?
Theoretical implications?
Alternative explanations addressed without slamming own research?
Practical implications?
Future research?
IAW p. 19 of this handbook?

7. NOTES & REFERENCES (_____) _____

Are all citations in text in the reference list?
Are all references properly documented in agreement with The Little, Brown Handbook, the Dean's Documentation of Written Work, and the APA Publication Manual (IAW p. 20-21 of this handbook)?

8. Grammar/Spelling/Punctuation (_____) _____

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APPENDIX D

Oral Report
Evaluation Criteria

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Evaluation Criteria
ORAL REPORT

NAME _____ Score (Out of ___Pts.)_____
_____
_____

INTRODUCTION (_____) _____
- Brief, broad background (establish interest)?
- Was the purpose defined?
- Was the lit review accurate, sufficient?
  - Theory?
  - Domain?
  - Methodological?
- Was the hypothesis well stated?
- Was the research and hypothesis logically supported/justified?

METHOD (_____) _____
- Were participants' demographics adequately covered?
- Was explanation of apparatus used clear, precise, and comprehensive?
- Was the design logically support hypothesis testing?
- Were the variables well defined?
- Was the procedure clear and chronologically ordered?

RESULTS (_____) _____
- Was (were) the appropriate test(s) used?
- Were the data presented clearly without bias?
- Were the Tables/Figures well organized?
- Were the data accurately interpreted?

DISCUSSION (_____) _____
- Hypotheses addressed?
- What was impact on theory?
- Were practical implications addressed?
- Were the implications logically supported by the results?
- Were alternative explanations for the results addressed?
- Were conclusions/future directions presented?

QUESTION & ANSWER (_____) _____
- Were the cadets poised and confident?
- Were the responses reflective of preparation?
- Were the questions adequately answered?

Tips in Preparing for a Presentation

1. **Do not read your report.** Boring. Your audience wants to hear you talk, not listen to you read.

2. **Make notes.** Use index cards or some other method. Organize your cards and number them clearly according to the order in which you will use them.

3. **Secure the attention of your audience.** Your discussion of the background should also serve as an "attention grabber."

4. **Use connective sentences and phrases.** The ear cannot check back or jump ahead as can the eye. Therefore, you must remind your audience of what they have just heard and prepare them for what they are about to hear whenever you go from one idea to another. Example: "Now that you have a clear idea of what causes multiple sclerosis, it is time to look into some of the potential cures that are being reported."

5. **Rehearse your speech**. Time your talk. Learn to handle your notes naturally. If you have overhead transparencies or PowerPoint slides pay special attention to the transitions between subsequent slides (and to the transition between the ideas or discussion points illustrated by subsequent slides). In most cases you must complete your talk in no more than 12 minutes.

6. **Other Suggestions.** As you speak, look directly at each individual in the audience. Eye contact is very important in the overall impression that you make. Always present information in graph or picture form when possible. Visual aids should be clear, labeled, and legible. Avoid detailed calculations, "busy" looking pictures or graphs. Follow the "keep it simple" principle.

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APPENDIX E

Checklist for Critical Evaluation of Research Articles

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Questions for Evaluation of Research Articles

Introduction

1. What is the author's goal? (test a theory? introduce a new theory? Investigate a theory under specific circumstances? review of a particular problem area? investigate solutions to a problem? Exploratory research?)
2. How comprehensive is the lit review? Have important articles or areas been neglected? Could any of these citations bear fruit for my own introduction?
3. What are the hypotheses?
4. Given his introduction, are the research and hypothesis logically supported/justified? (Look for fallacies in the author's arguments: provincialism, false dilemmas, hasty conclusions/generalizations, circular logic, purposeful ambiguity or inappropriately operationalized concepts and variables).

Method

5. Who are the subjects?
   - Are selection procedures adequate (number/type of subjects)?
   - Do the demographics and psychographics match the target population?
   - Given the characteristics of the sample, can the results be generalized to larger populations?
6. What are the independent, dependent, and extraneous variables?
7. Is the experimental design appropriate for actually testing the hypothesis?
8. Are extraneous variables adequately controlled?
9. How appropriate are the stimuli, materials, and apparatus?
10. How appropriate are the procedures?
    - Are tasks/events properly sequenced?
    - Are instructions leading or misleading?

Results

11. Has the data been properly analyzed?
    - Could alternative or additional analyses be performed?
    - Have critical analyses been neglected?
    - How were the data coded? reduced?
12. Are the tables and figures clear/properly prepared? Are they misleading?
13. What were the results? Did the author get the "wrong" results?

Discussion

14. Do the results support the hypotheses?
15. Are there alternative explanations for the findings? Are they adequately discussed?
16. What are the theoretical implications of the findings?
17. What are the practical implications of the findings?
18. Do you agree with the author's interpretation of the results? Are there fallacies in the author's logic leading to the theoretical and practical implications s/he cited?
19. What additional research might be performed to increase understanding of the problem?

Relevance

20. How does this research/literature inform my research? To be useful it should:
    - Describe psychological theories that are relevant to the behavior under study in my research
    - Describe methodologies used by other researchers studying similar problems
    - Describe the Domain in which I am studying behavior (military settings, law enforcement settings, civilian settngs, etc.)

These questions are modified from Weimer, Research Techniques in Human Engineering. 1995. Upper Saddle River, NJ: Prentice Hall.

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Appendix F

Symbols, Conventions,

&

Buzzwords

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Symbols, Conventions, & Buzzwords

The items listed below represent a fairly complete sample of commonly encountered key terms, symbols, abbreviations, and other conventions used in technical reports in our discipline. They are arranged alphabetically. Greek letters are fitted at the end of alphabetic lists for their English counterparts. If there is no counterpart (like ψ), entries are placed at the end of the list. If a term is in italics, it should be underlined in your reports.

A/D	Analog-to-digital conversion
ad lib.	*ad libitum*. Literally "at pleasure." When rats are placed on an ad libitum feeding schedule, they have all the food they want all the time.
AP	Anterior-posterior axis.
a posteriori	A conditional probability; P [A/B] ("probability of event A given condition B").
a priori	A probability stated in advance of some manipulation, generally used as a criterion. The *a priori* criterion for most experiments is α, the probability of a Type I error.
ANCOVA	Analysis of covariance (ANOVA with one or more regression variables [covariates]).
AND	A Boolean logical state; the intersection of two conditions.
α	Probability of a Type I error. Statistical symbol of treatment effect for ANOVA.
BCD	Binary coded decimal.
Bipolar	In electroencephalography, measurement of an area across both hemispheres (see unipolar).

bregma	Junction of coronal and sagittal sutures; stereotaxic reference point.
β	Beta (Greek letter); (1) *a priori* probability of a Type II error; (2) criterion level for a sensory decision; (3) standardized regression coefficient; (4) population parameter for regression coefficient
C	The statistic associated with the Friedman test; contrast.
candela (cd)	Unit of luminous intensity.
cd/m2	Candelas per square meter (measure of luminance).
c/d	Cycles per degree
CFF	Critical flicker frequency
chi square	Statistical test of association or goodness of fit; the chi square distribution.
CIE	*Commission Internationale de l'Eclairage*; source of standards for light and color.
CR	Continuous (FRI) reinforcement
CRT	Cathode ray tube - refers to a vector-type display (like an oscilloscope); TV screens use a raster display, and are generally referred to as VDT.
CSF	Contrast Sensitivity Function
c/s	Cycles per second (usually Hz).
curve, tuning	A function associated with some signal distribution with a center peak and bandwidth.
CVC	Consonant-Vowel-Consonant; a type of trigram.
D/A	Digital to analog conversion.
dB	decibel
Delta	A category of brain activity.

Dexamphetamine	Dexadrine; an indirect dopamine agonist.
DRL	Differential reinforcement, low frequency (operant terms).
DV	Dorsal-ventral axis
E, Es	Experimenter(s)
ε	In regression equation, unexplained or residual error.
F	The *F* statistic.
FFT	Fast Fourier Transform
FI	Fixed interval reinforcement schedule
fL	Foot-Lambert (measure of luminance).
FR	Fixed ratio reinforcement schedule
g	(1) Gram. (2) Gravitational force
γ	Gamma - statistical
Graticule	A grid superimposed on a display for estimating magnitudes of deflection.
Hz	Hertz (cycles per second)
HZP	Horizontal zero point of de Groot
im	Intramuscular (injection)
I/O	Input-output
ip	Intraperitoneal (injection)
ISI	Interstimulus interval
iv	Intravenous (injection)
IV	Independent variable
jnd	Just noticeable difference

k	Number of groups in an ANOVA design
Ketamine	Relaxant used as a precursor to anesthesia
kg	Kilogram
LED	Light-emitting diode
linearized	Converted to a linear scale, usually for ease of adjustment of measurement.
lumen	Unit of luminous intensity
lux	Unit of illuminance
λ	The wavelength
mA	Milliampere
manipulandum	"That which is manipulated;" the experimenter's control for reinforcement (see operandum).
MANOVA	Multivariate analysis of variance
mg	Milligram
ML	Medial-lateral axis
ml	Milliliter
mL	Millilambert (see fL)
monopolar	In EEG, measurement on one hemisphere
ms	Millisecond
MTF	Modulation transfer function
mV	Millivolt
μ	"Mu" (Greek letter); the population mean
μg	Micrograms
μV	Microvolt

N	Noise or population size
n	Sample size
nit	(alt.) cd/m2
NOR	Logical Boolean operator; "not OR"
ns	Nonsignificant
ν	"Nu" (Greek letter), distinct for italic *v*
O, Os	Observer(s)
ONEWAY	The one way (one IV) ANOVA
operandum	"That which is operated;" the bar or tilt rod or other device that a Participant uses to make an operant response (see manipulandum)
OR	A logical Boolean operator
P, Ps	Participant(s)
p	Post hoc probability that a Type I occurred (e.g., "p < .05")
paralog	Nonsense syllable
post hoc	After the fact (literally "after this"); usually an inferential test made in the absence of a priori hypotheses, such as the multiple range tests.
P[x]	A priori probability of occurrence of x
P[x|y]	A posteriori probability of x given y
R	Response
*n*R	Number of responses (Mechner operant notation)
RF	Radio frequency
ROC	Receiver-operating characteristic curve

ρ	"rho" (Greek letter); the statistic associated with the Spearman rank-order "correlation coefficient;" also r_{rho}
S	Stimulus
S, Ss	Subject(s)
s	Sample standard deviation
$\hat{\mathbf{s}}$	"s hat;" unbiased estimate of sample standard deviation
s^2	Sample variance
SA	Aversive or noxious stimulus; punishment
sc	Subcutaneous (injection)
SD	Standard deviation (alt)
S_D	Discriminative stimulus
S_Δ	"S-delta;" an inappropriate discriminative stimulus
SDT	Signal Detection Theory
SE	Standard error of the mean
SN	Substantia nigra (anat.); Signal/Noise distribution
S_{R+}	Positive reinforcer
S_{R-}	Negative reinforcer
standardized	Value of normally distributed variable expressed in standard units, or number of standard deviations from distribution mean
S_0	Extinction contingency (no reinforcer)
σ	Population standard deviation
σ^2	Population variance
T	Time (Mechner notation)

t	The t-statistic
TSD	Theory of Signal Detection
*n*T	Period of time; delay (Michner)
TTL	Transistor-to-transistor logic
U	Test statistic for the Mann-Whitney test
VZP	Vertical zero point of de Groot
XOR	Logical Boolean operator; exclusionary OR mask
z	The *z*-statistic or distribution

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APPENDIX G

Common Nomenclature

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Common Nomenclature

You will frequently use laboratory apparatus for your experiments. Since this will often be cited in your Method section, a list of common nomenclature for apparatus is provided below by function.

Acoustic Chambers

All acoustic chambers in the laboratory are manufactured by Industrial Acoustics Corporation (IAC). The two-room chamber in the acoustic lab (Thayer Hall, Room 268) is an IAC-1200 ACT. The two-room chamber that contains the speech lab (Thayer Hall, Room 262B) is an IAC-1000-ACT.

Auditory Instruments

Auditory equipment used in the laboratory is made by KAY Elemetrics, ISAAC, and Coulborn instruments. Common equipment includes; signal generators, pulse generators, A/D and D/A converters by Isaac, voltage-controlled oscillators, attenuators and bandpass filters.

Computers

Dell Dimension
Digital Celebris GL5100 (2)
EDS Model ASL 433, 486 (7)
Hewlett packard Vectra
MPC ClientPro

Hand Held Computers

Sony Clie PEG SJ22
Palm M515

Computer Software Packages

Aldus Photostyler
Aldus Superpaint 3.0
Altia design
Autocad R13
Autographics 1.00
Close-up 4.0
Computerized Speech lab
CPOF (Command Post of the Future)
DSN/Labsoft
Falcon
Fast Spectra Scanning System

Computer Software Packages (Cont.)

GW-Basic 3.2
HP Superstore
Image Analysis System software by Delta
Labview 5.0
MacBeth
Mannequin
MCL (manual control laboratory)
Mental Model Research
Memory by MicroExperimental Lab
Microsaint
Minitab
Perception by MicroExperimental Lab
Photofinish
Pizazz
Powerpoint
Sigmaplot by Jandel Scientific
SPSS for Windows
TiGR (Tactical Ground Reporting)
Turbo Pascal 7.0
Virtual World
Virtus Walkthrough Pro
Vision Lab 1.5
Vissim
Word

Microscopes

Fischer Scientific binocular
Meiji stereomicroscope
Unitron phase contrast microscope
Wolfe 1201 trinocular
Wolfe stereomicroscope
Wolfe/Teli microvideo system
Wolfe trinocular stereomicroscope

Photography

Olympus digital camera
Sony Digital Video Camera Recorder, Model DCR-TRV20

Physiological Measurement

Bio-oscilloscope (Phipps & Bird)
Physiograph (Tektronix)
Coulbourn Suite
Anthropometric Measurement Kit
Minimitter Actiwatch Sleep Measurement System (Model AW64)
Peak Performance Technologies 2D, Digital Motion Capture System
PMI FIT Series 2000 Workplace Safety Screener

Visual Stimulus Presentation, and Visual Measurement Apparatus

Armed Forces Vision Tester, Bausch & Lomb
ASL Series 5000 Head-mounted Eye Tracking System, with Ascension Technology Corporation's "Flock of Birds" Head Tracking System
Light discrimination apparatus, Lafayette Model 13014
Spatial frequency acuity tester, Vistech VCTS
Smart Technologies Corporation's Rear Projection SmartBoard, Model 3000i
Pioneer Plasma Screen, Model PDP503CMX

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Appendix H

Common Cadet Errors

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Common Cadet Errors

General Comments

1. Do not use the words "prove" or "disprove." Science can only provide evidence to either support or reject a hypothesis.

2. Avoid passive voice whenever possible.

3. Avoid the use of first (we and I) and second person (you) whenever possible. Although acceptable to use these voices in scientific writing, their overuse will detract from the quality of the paper.

4. Data are plural; datum is singular. Do not say "the data is!"

5. Do not overuse the word "which." Usually "that' is more appropriate than "which." "Which" is generally only used to offset a clause. Also, do not use unnecessary "that's." A common mistake is to use 'that" when it is not needed. Go on a "which" and "that" hunt with the search option on your word processor.

6. "Effect" is a noun and "affect" is usually a verb, unless you mean an emotion.

7. Use commas. People tend not to use enough commas. Put a comma at a natural pause in a sentence or to offset a clause.

8. Avoid ambiguous pronoun references, such as "it," "this," "that," "these," and "those;" especially to start a sentence. Use specific references instead. Also, do not use a pronoun to tie a thought or idea in one paragraph to a similar idea in a previous paragraph.

9. Be Concise!!!!

10. Avoid terms first-, second-, third-, fourth-class, cow, plebe, yearling, etc. These terms are unfamiliar to a general audience. Use seniors, juniors, sophomores, and freshmen instead. Likewise, the use of the term "cadet" should be introduced as "a student (cadet) at a military college/university" to ensure complete understanding by a general audience.

11. Avoid military jargon when possible. Your scientific audience is predominantly military lay people. If needed, define the term when first introduced.

12. Periods and commas are always placed inside the quotation marks.

13. The Latin abbreviation *i.e.*, stands for *id est*, which means *that is*, or *in other words*. The letters *e.g.* stand for *exempli gratia*, which means *for example.* Use these abbreviations appropriately. Also remember that e.g., and i.e., are always followed by a comma.

Introduction

1. When you talk about a previous study's findings use past tense, since the study is over.

2. When you talk about a study supporting your line of reasoning, use present tense.

3. Be sure to develop the logic that underlies your hypothesis(es).

4. The title is on the first page of the introduction, not the word "Introduction."

Method

1. Describe detailed tasks in a section of its own, not in the procedure section.

2. Statistical packages are considered to be part of the methods and are usually only mentioned if they are not common.

References

1. Ensure all references in text are cited in the References section.

2. Ensure all references are alphabetical by first author's last name.

Tables and Figures

1. Make sure you reference all figures and tables in text and place them as close to the affected text as possible. Never put the figure or table in text before it is referenced.

2. Titles of tables and figures should be self-explanatory.

3. Title of a figure goes ***below*** the figure. Title of a table goes ***above*** the table.

4. When referring to a table and figure in text they are always capitalized (e.g., Figure 2, Table 4, etc.).

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Appendix I

Sample APA Style Paper

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UNITED STATES MILITARY ACADEMY

SITUATION AWARENESS AND THE LAND WARRIOR SOLDIER: THE DEVELOPMENT AND IMPLEMENTATION OF METRICS TO TEST SA

PL490: ENGINEERING PSYCHOLOGY DESIGN AND APPLICATIONS

SECTION 1A

COL LAWRENCE G. SHATTUCK

BY

CADET BOYCE R. BUCKNER, 01, CO A2

BENJAMIN R. CROMBE, 01, CO F3

WEST POINT, NEW YORK

06 MAY 2001

Situation Awareness and the Land Warrior Soldier:

The Development and Implementation of Metrics to Test SA

Boyce R. Buckner and Benjamin R. Crombe

United States Military Academy

Author Note

[Author note & correspondence information would be added here, as shown in samples provided within the handbook.]

Abstract

The present research deals with the testing of situation awareness (SA) and the Land Warrior System. Metrics to test an infantry squad's SA were developed by modifying Endsley's Situation Awareness Global Assessment Technique (SAGAT) for the researchers' purposes. The queries developed were asked during four breaks in a computer based land warrior simulation to groups using Land Warrior displays and groups using conventional information. The hypothesis was that groups using conventional methods would perform just as well as groups using the land warrior displays due to information overload and screen clutter of Land Warrior. In most cases, participants using Land Warrior displays and those without performed the same, but for locating their position or their enemy's position, those using Land Warrior performed better.

Situation Awareness and the Land Warrior Soldier:
The Development and Implementation of Metrics to Test SA

With the emergence of new technology, many system designers have been attempting to incorporate these innovations into the workforce. Presently, there is a challenge in incorporating this new technology into the weapon systems of the armed forces of the United States. For example, the Land Warrior system is one of the latest systems that have been developed by the military to help enhance situation awareness (SA) on the battlefield for the infantry soldier. Since its creation, the system has undergone rigorous testing and experimentation, which has resulted in numerous changes and modifications from its initial design. Despite the many methods used by researchers to test the Land Warrior system, there is currently no system to measure SA. This poses a problem with the testing process of the system since there is only a limited ability to measure the cognitive functions that the system is intended to enhance. Therefore, present study attempted to help find a solution to this problem by creating metrics to measure SA in the individual soldier. These metrics provide the researchers with the ability to determine if SA is better in a soldier equipped with the Land Warrior than in a soldier with no technologically advanced system.

The ability to provide an individual with large amounts of information often results in information overload. A previous study on information overload found that when a person receives too many pieces of information simultaneously, information overload occurs (Radar, 1981). The study showed that a person could only mentally hold five or six communication inputs at a time before their processing efficiency began to decline. Expanding on this theory, Jacoby found that when tasking consumers to choose

the best product, the probability for consumers to choose the best product decreased as the number of choices increased (Jacoby, 1984). Additional studies show that when a participant is given a large quantity of information, as opposed to a smaller amount of quality data, they are more likely to commit errors (e.g., Keller & Staelin, 1989). This relates directly to how much information is displayed through the Land Warrior system. If the Land Warrior displays too much information, the performance of the participants in SA tests will decline when compared to a non Land Warrior equipped soldier. Information overload does not only affect a person mentally, but also affects a person physically, leading to poorer performance in long duration experiments (Lipowski, 1975). Although these studies indicate that the presence of too much information results in overload, other researchers found that the results are not always "clear cut and precise" (Malhotra, Jain, & Lagakos, 1982). Malhotra examined research done on information overload and found that not all results showed that information overload led to lower performance. This is due to the lack of a fixed line for determining what constitutes information overload, which indicates a possibility that different experiments could find different results with essentially the same procedure.

These studies suggest that it is important for designers of the Land Warrior system to reduce the potential for information overload occurring with the infantry soldier. The researchers took these studies into account when developing their metrics by recognizing that there are multiple echelons of infantry soldiers that require different information to perform their duties, which indicate that one system of metrics will not suffice for a thorough investigation of SA. Instead, these metrics must evaluate SA at

each individual soldier level. This, in turn, led to the researchers testing both members of squad and squad leaders using different queries.

There has been a great deal of controversy on the actual definition of SA. Some researchers view SA principally in the cognitive domain (Hariman & Secrist, 1991) or as a management of attention (O'Hare, 1997). SA can also be viewed as a "person's *perception* of the elements of the environment within a volume of time and space, the *comprehension* of their meaning, and the *projection* of their status in the near future" (Endsley, 1995b, p.65). Although there are multiple definitions of SA, the authors determined that the definition proposed by Endsley (1995b) is the most widely accepted definition existing for SA, and will be used as their definition in the present study.

The idea of cognitive integration as proposed by Shattuck, Graham, Merlo, and Hah (2000) demonstrates how individuals combine pieces of data to develop an overall understanding of the information. Without this cognitive integration a person could not combine all of the information to comprehend the situation and make projections about the future (Shattuck, Merlo, & Graham, 2001). The present study is unique in that it focuses on the perception level of SA, excluding the comprehension of information and projection of information into the future. We make this distinction but we acknowledge that future studies should include cognitive integration as a theoretical construct if the focus of the research includes the SA levels of comprehension and/or projection.

When people are working as a team in a dynamic environment, all people do not need to know the same information (Endsley, 1995a). This suggests that researchers should ask squad leaders and member of squads (MOS's) different questions to determine SA. Endsley developed the Situation Awareness Global Assessment Technique

(SAGAT) to test individuals' SA in different dynamic environments. She validated the effectiveness of the SAGAT technique by showing that stopping a scenario and the length of the break did not affect performance or SA (Endsley, 1995b). Based on the strengths found in Endsley's SAGAT technique, the researchers implemented a similar method to evaluate SA (Vidulich, 1994).

The researchers of the present study had to adapt the SAGAT technique to their purposes with the Land Warrior system. They followed the process that Matthews, Pleban, Endsley, and Strater (2000) used to measure the SA of infantry soldiers in a virtual MOUT environment in order to adapt SAGAT to their infantry scenario. In addition, they also interviewed Endsley to determine how long the breaks in the scenario should be and the number of questions to use (Endsley, Feb 2001). Furthermore, the researchers discovered that using experts as a standard to compare the participants to is a good method to rate SA (McCloskey, Feb 2001). The researchers believe they are justified in using this approach. Experts perform at a greater level than novices because they operate at the skill-based level and make quicker and more accurate decisions (Kass, Herschler, & Companion, 1991).

It is important to test the SA of soldiers when they receive new systems such as the Land Warrior because the technology may interfere with SA. These new systems may unwittingly increase the amount information received or alter the format of the information (Endsley, 1998). By developing and testing the metrics to assess SA the researchers are proposing a method to determine if these proposed systems improve the infantry soldiers' SA.

The researchers do not believe that the Land Warrior system will improve the SA of infantry soldier's at the squad level because of information overload and the "clutter cost" of the Land Warrior display (Yeh, Merlo, & Wickens, 2001, p.29). Therefore, the researchers hypothesize that there will be no difference in SA between a group using the Land Warrior system and a group using the current system for SA.

Method

Participants

The authors of the present study used approximately 126 college freshmen currently attending the United States Military Academy. These individuals signed-up for the study on a voluntary basis to earn bonus points towards their grade in their General Psychology course. The participants were randomly divided into two groups of 63. The first group was the “Land Warrior” group, and the latter was the “Non-Land Warrior” group. In order to assist the researchers in the experimentation, an additional volunteer group was used to play the role of the opposition force during the experiment. No data was collected from this group.

Participants were treated in accordance with ethical standards established by the American Psychological Association. The research methods used in this experiment were approved by the U.S. Military Academy Human Subjects Use Committee.

Apparatus

The participants viewed the scenario on a SV100 Super View Series Televideo Monitor. All participants had their individual computer console to operate on, which includes a keyboard and mouse to enter their commands for the role that they will play. A list of commands was attached to the participant’s console.

Procedure

The scenario combat simulation was devised through the program, Delta Force: Land Warrior. In this scenario, up to ten participants played interactively as an infantry squad, with one squad leader and nine members of squad. The scenario placed the participants into the "box" at the Joint Readiness Training Center, Ft Polk, LA. The mission of the simulation was for the infantry squad to conduct movement to an objective (an enemy bunker) and to attack/seize that objective. In this case, the squad conducted movements to two checkpoints, reacted to an enemy patrol, and conclude with a planned attack on an enemy bunker. The Land Warrior group had the Heads-up Display on the upper left corner of their monitor, which in turn will provide them with all the capabilities the Land Warrior System.

The metrics for measuring Situation Awareness were four different sets of multiple choice questions designed for this experiment, a total of twenty (seventeen for MOS's) questions. Each set of metrics was given to every participant on four separate occasions during the experiment. The participants received a test sheet with their questions, and circled their responses on the sheet, which the researchers collected at the end of the scenario.

The independent variable for this experiment was the information system used by the participants to execute their mission, either with or without the Land Warrior display. The dependent variable was the level of Situation Awareness determined by the correctness of the participants' responses to the researchers' queries. The experiment was and independent, or between groups, design.

The participants were randomly divided into two testing groups, the Land Warrior group and Non-Land Warrior group. Each group was comprised of 63 participants. From there, the researchers randomly selected seven participants from each testing group to play the role of squad leader for their experiment. The remaining 56 participants in each group played the role of members of an infantry squad. Additional participants that signed-up after 126 participants were achieved were assigned the role of the opposition force (OPFOR), and were tasked to attack and defend against the participants in the experiment. No data was collected from this group. Once the researchers determined the testing groups, they tested the Land Warrior group in seven separate sessions. Each session tested one squad composed of one squad leader and up to ten members of squad. The participants met in a computer lab, where they received their introductory briefing, and completed all before-experiment paperwork. Once this administrative portion was completed, the researchers then provided an operations order (OPORD) of the mission to the squad leader and MOS's. When the OPORD completed and all participants were ready, the researchers began the simulation. One researcher was present in the computer lab with the infantry squad, while the other researcher was in a different section of the computer lab, leading the opposition force (OPFOR). During the simulation, the researcher with the infantry squad froze the scenario and had the participants turn off their screens four separate times. At each of the four breaks, the researcher then administered the situation awareness queries. Each set of queries was different, and given at checkpoints 1, after reacting to an enemy patrol, after killing the patrol, and during the final battle of the simulation. When all data was collected for the Land Warrior group, the researchers then repeated the same process for the Non-Land Warrior

group without the addition of the heads-up display and technology that the Land Warrior system provides. Upon collection of all participant data, the researchers then recorded all scores of each participant group, and prepared the data for statistical analysis.

Results

The main findings of the experiment are displayed in Figures 1 and 2, which show SA scores for selected SAGAT probe questions for squad leaders (Figure 1) and MOS queries (Figure 2). The effects of using the Land Warrior system appears to vary with type of question posed, and also with level of analysis, i.e., squad leader vs. MOS.

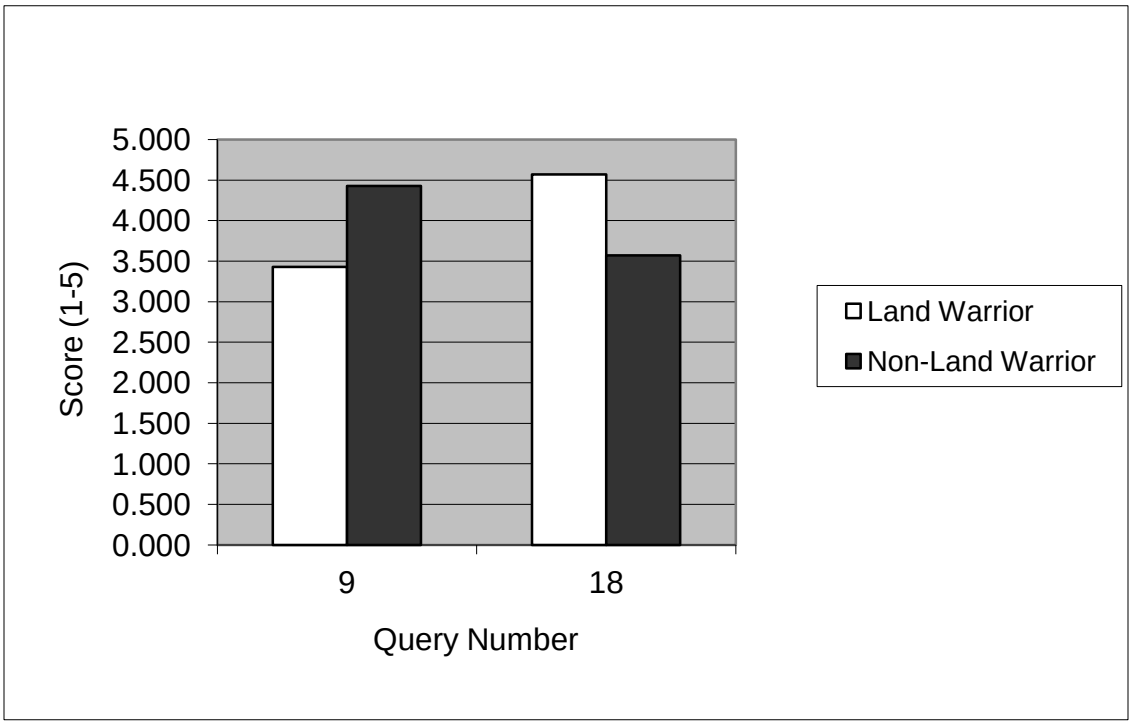

Figure 1. Graph comparing significant query results of SL Data.

The mean scores for questions 1, 8, and 13 differed significantly between the MOS Land Warrior and MOS non-Land Warrior group, $t(56) = 3.95$, $p < .05$; $t(56) = 3.86$, $p < .05$; and $t(56) = 3.86$, $p < .05$ respectively. Question 1 favored the non-Land

Warrior group, while 8 and 13 favored the Land Warrior group. The mean score for question 9 for the SL group differed significantly towards the non-Land Warrior group, $t(56) = 4.01$, $p < .05$. Question 18 for the SL group and questions 2 and 5 for the MOS group all approached significance in favor of the Land Warrior group. (See Figures 1 & 2 for graphs of significant query data.)

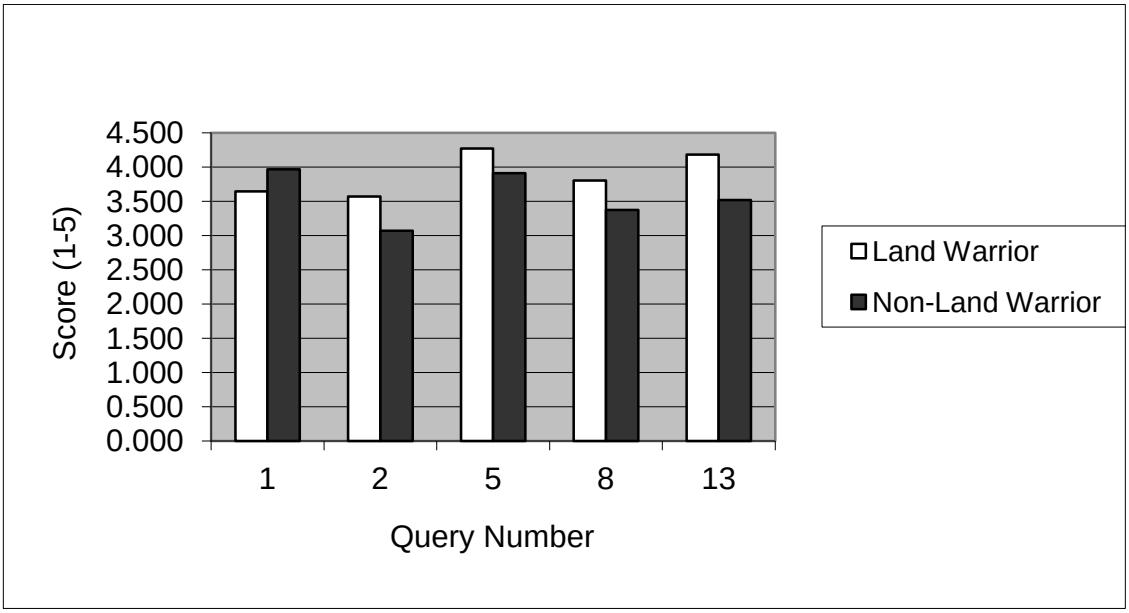

Figure 2. Graph comparing significant query results of MOS Data.

Discussion

The results showed that in most cases the SA of those using the Land Warrior and those not using the Land Warrior was not significantly different. This supports the researchers' hypothesis. Four cases showed significance and three others approached significance. Out of these seven cases, two showed that those not using the Land Warrior display performed better while the other five showed that the Land Warrior group performed better. Much debate exists on the potential benefit of the Land Warrior system

in facilitating warfighting, especially among infantry forces (Graham & Matthews, 1999). The current results indicate that effects – either facilitative or inhibitive – may depend on echelon and task assessed.

The squad leader group showed that the non-Land Warrior was significantly better for question 9. This question dealt with the capabilities of the enemy. For the MOS, question 1 was shown to be significantly better for the non-Land Warrior group. This question was about the commander's intent for the mission. What these two cases do show though is that our idea that too much information given by the system would overload the soldier may be correct because they did better on these two questions that dealt with memory in the case of the commanders intent or observation/memory in the case of the capabilities of the enemy.

The SL group showed that question 18 approached significance in favor of the Land Warrior group. This question asked for the position of the enemy forces. For the MOS groups, questions 8 and 13 were significant for the Land Warrior group. These questions again asked for the positions of the enemy forces. Also, questions 2 and 5 approached significance for the Land Warrior group. These questions referred to their position and the position of the enemy respectively.

These findings are interesting considering one of the main purposes of the Land Warrior is to help navigation. These findings suggest that the Land Warrior system actually does achieve one of its stated purposes of helping with navigation or position location. This aid to the infantry soldier would be helpful in missions, accountability of friendly soldiers, and finding the position of enemy soldiers.

The other questions showed no significant difference between the Land Warrior and non Land Warrior group. This is important because if the system does not help a soldier, the Army should not spend the money to equip units with it, train them on it, and make them carry the extra weight.

As with any research, there exists the possibility of methodological problems that may have affected on the outcome of the results. One primary methodological problem that the researchers noted in the present study was the lack of equal skill level in each participant with respect to the Delta Force Land Warrior game that the researchers used to create their simulation. The researchers found that some of these individuals played an earlier version of the game on a daily basis in addition to experience with the game from their Military Science class. The unequal skill level created through the use of the Delta Force simulation might have affected the outcome. The researchers did try to account for this problem by randomly selecting the groups prior to experimentation, which provided some balance of the skilled participants. However, they may have accounted for this problem better by using a simulation that all participants had an equal initial skill level, or by implementing training sessions with the Delta Force Land Warrior game to bring all participants to the same skill level. Certainly, evidence exists that skill level or expertise affects SA, decision-making, and related cognitive processes in tests involving simulated (Shattuck, et al., 2001) and virtual (Pleban, Eakin, Salter, & Matthews, 2001) exercises.

Given that research in situation awareness metrics for the Land Warrior system is relatively new, the researchers believe that further studies should be conducted to account for areas that the present study did not address. The present study only evaluated level one of situation awareness, an individual's perception of the surrounding environment.

Future studies should consider the possibility of evaluating situation awareness of the Land Warrior system at levels two and three, comprehension and projection. This would be consistent with Endsley et al. (2000) who maintain that all three levels of SA must be assessed to get a complete picture of a soldier or leader's SA. This may add to the support found in the present research that indicates there is no difference in situation awareness, except for position location, when comparing the current system to the Land Warrior System. Another consideration for future research ought to be focused on navigation and position location, which the researchers found to be significant. One final recommendation for future studies is to consider evaluating situation awareness in individuals equipped with Land Warrior when the technology fails to function. The researchers believe that it is important to recognize that given any type of advanced technology, there exists the possibility that the technology may fail. By studying situation awareness in this sense, not only may the researchers find additional support that indicates the Land Warrior does not improve situation awareness, but they may also find results that show negative impact in performance of situation awareness tasks should an individual lose this technology during a field operation.

Notes

1. Mica R. Endsley, assistance given to author, verbal discussion, West Point, NY, 28 Feb 2001. Mica Endsley answered questions and made suggestions about length of breaks and number of questions to ask during freezes using the SAGAT technique. She also answered questions about whether our method was good or not.

2. Mike McCloskey, assistance given to author, verbal discussion, West Point, NY,15 February 2001. Mike McCloskey answered questions and gave advice on using experts as our measuring stick for the SAGAT queries and thought it was the best way to go.

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Appendix A

P Value and Mean Matrix For Squad Leader Data

QUERY	1	2	3	4	5	6	7	8
LW:Mean	4.000	3.860	5.000	4.714	4.290	4.286	3.290	3.857
NLW: Mean	4.000	3.290	4.857	5.000	3.860	4.143	4.000	3.714
p value	1.000	0.484	N/A	N/A	0.477	0.718	0.261	0.552

QUERY	9	10	11	12	13	14	15	16
LW:Mean	3.430	5.000	4.714	4.429	4.857	5.000	4.429	3.710
NLW: Mean	4.571	4.857	4.571	4.714	4.714	4.428	4.571	4.000
p value	0.049	N/A	0.735	0.430	0.552	N/A	0.698	0.646

QUERY	17	18	19	20
LW:Mean	3.286	4.429	3.710	4.286
NLW: Mean	3.571	3.570	4.290	3.710
p value	0.430	0.183	0.410	0.410

Appendix B

P Value and Mean Matrix For Member Of Squad Data

QUERY	1	2	3	4	5	6	7	8
LW:Mean	3.643	3.570	4.450	5.000	4.270	4.232	3.020	3.804
NLW: Mean	3.964	3.070	4.625	4.821	3.910	4.250	3.070	3.375
p value	0.036	0.096	0.366	N/A	0.151	0.924	0.797	0.004

QUERY	9	10	11	12	13	14	15	16
LW:Mean	4.000	4.679	4.500	4.500	4.180	3.410	4.110	3.790
NLW: Mean	3.910	4.607	4.571	4.589	3.520	3.643	3.910	4.050
p value	0.665	0.686	0.626	0.631	0.004	0.258	0.341	0.209

QUERY	17
LW:Mean	3.960
NLW: Mean	4.090
p value	0.587

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